TWIN DISC
INCORPORATED

# Service Manual

## Marine Transmission

Components:

- MG-5202SC
- MG-5203SC
- MG-5204SC
- MG-5202DC

Document Number: 1017462

## NOTICE

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#1017462

**Marine Transmission**
**Service and Installation Manual**

# Models MG-5202SC, MG-5202DC, MG-5203SC, MG-5204SC

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**Twin Disc, Incorporated**
1328 Racine Street
Racine, Wisconsin 53403 U.S.A

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# COMMERCIAL MARINE TRANSMISSION

A. Twin Disc, Incorporated warrants all assembled products and parts, (except component products or parts on which written warranties issued by the respective manufacturers thereof are furnished to the original customer, as to which Twin Disc, Incorporated makes no warranty and assumes no liability) against defective materials or workmanship *for a period of twenty-four (24) months from the date of shipment by Twin Disc, Incorporated to original customer, but not to exceed twelve (12) months of service, whichever occurs first.* **This is the only warranty made by Twin Disc, Incorporated and is in lieu of any and all other warranties, express or implied, including the warranties of merchantability or fitness for a particular purpose and no other warranties are implied or intended to be given by Twin Disc, Incorporated.** The original customer does not rely upon any tests or inspections by Twin Disc, Incorporated or on Twin Disc, Incorporated*s application engineering.

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3. The warranty is void if any modifications are made to any product or part without the prior written consent of Twin Disc, Incorporated.

4. The warranty is void unless the product or part is properly transported, stored and cared for from the date of shipment to the date placed in service.

5. The warranty is void unless the product or part is properly installed and maintained within the rated capacity of the product or part with installations properly engineered and in accordance with the practices, methods and instructions approved or provided by Twin Disc, Incorporated.

6. The warranty is void unless all required replacement parts or products are of Twin Disc origin or equal, and otherwise identical with components of the original equipment. Replacement parts or products not of Twin Disc origin are not warranted by Twin Disc, Incorporated.

C. As consideration for this warranty, the original customer and subsequent purchaser agree to indemnify and hold Twin Disc, Incorporated harmless from and against all and any loss, liability, damages or expenses for injury to persons or property, including without limitation, the original customer*s and subsequent purchaser*s employees and property, due to their acts or omissions or the acts or omissions of their agents, and employees in the installation, transportation, maintenance, use and operation of said equipment.

D. Only a Twin Disc, Incorporated authorized factory representative shall have authority to assume any cost or expense in the service, repair or replacement of any part or product within the warranty period, except when such cost or expense is authorized in advance in writing by Twin Disc, Incorporated.

E. Twin Disc, Incorporated reserves the right to improve the product through changes in design or materials without being obligated to incorporate such changes in products of prior manufacture. The original customer and subsequent purchasers will not use any such changes as evidence of insufficiency or inadequacy of prior designs or materials.

F. If failure occurs within the warranty period, and constitutes a breach of warranty, repair or replacement parts will be furnished on a no-charge basis and these parts will be covered by the remainder of the unexpired warranty which remains in effect on the complete unit.

# TWIN DISC, INCORPORATED
# FLAT RATE HOUR ALLOWANCE

(Hourly Labor Rate Must be Acceptable to Twin Disc, Incorporated.)

## COMMERCIAL MARINE TRANSMISSIONS - ALL RATIOS:

| MODEL SERIES | R&R | UNIT REBUILD | CLUTCH REPAIR (BOTH PACKS) |
|---|---|---|---|
| MG 502, MG 5010, MG5011, MG5005A MG5015A | 10.0 | 8.0 | - |
| MG 506, MG5061, MG 5050, MG5055A | 10.0 | 11.0 | - |
| MG 507, MG 5081, MG5085, MG5090, | 10.0 | 12.0 | - |
| MG 5091 | 10.0 | 12.0 | 4.0 |
| MG5112,MG5113 | 10.0 | 17.0 | - |
| MG 509, MG 5111, MG5114 | 10.0 | 17.0 | 4.0 |
| MG5114A, MG5114RV | 10.0 | 17.0 | - |
| MG 514C, MG514M, MG5141, MG514CHP | 10.0 | 25.0 | 6.0 |
| MG 516, MG 5161 | 10.0 | 28.0 | 8.0 |
| MG 518-1 | 10.0 | 32.0 | 10.0 |
| MG520-1, MG 5202, MG5203, MG5204 MG5205 | 10.0 | 32.0 | 10.0 |
| MG 530, MG530M, MG5301 | 12.0 | 32.0 | 16.0 |
| MG 540 | 20.0 | 62.0 | 20.0 |
| MG5600 | 20.0 | 62.0 | 20.0 |
| MG6000 | 10.0 | 32.0 | 10.0 |
| MGN80, MGN232, MGN233, MGN272, MGN273, MGN332, MGN334, MGN335, MGN432, MGN433, MGN472, MGN493 | 10.0 | 32.0 | 10.0 |
| MGN650, MGN800,MGN1000,MGN1400, MGN1600 | 20.0 | 62.0 | 40.0 |
| PUMP - ALL MODELS | 1.0 | - | |
| VALVE - ALL MODELS: | 1.0 | .5 | |

# Marine Transmission
# Service and Installation Manual

# Models MG-5202SC, MG-5202DC, MG-5203SC, MG-5204SC

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Section 1

# Introduction

## 1.1 General Information

This publication provides operating information for Twin Disc MG-5202DC, MG-5202SC, MG-5203SC, and MG-5204SC transmissions. Specific engineering details and performance characteristics can be obtained from the Product Service Department of Twin Disc, Incorporated, Racine, Wisconsin, U.S.A.

Operation and maintenance personnel responsible for this equipment should be familiar with this publication and have it at their disposal. A thorough understanding and application of the material in this manual will result in consistent performance from the unit and help reduce downtime.

## 1.2 Safety and General Precautions

### 1.2.A General

All personnel servicing this unit should employ safe operating practices. Twin Disc, Incorporated will not be responsible for personal injury resulting from careless use of hand tools, lifting equipment, power tools, or unaccepted maintenance/working practices.

### 1.2.B Important Safety Notice

Because of the possible danger to person(s) or property from accidents that may result from the use of machinery, proper installation, maintenance and operation procedures must be followed. Twin Disc, Incorporated will not be responsible for personal injury resulting from careless maintenance/ working practices.

Inspect as necessary to assure safe operations under prevailing conditions. Proper guards and other safety devices that may be specified in safety codes should be provided. These devices are neither provided by nor are they the responsibility of Twin Disc, Incorporated.

**⚠ WARNING**

**To prevent accidental starting of the engine when servicing Twin Disc marine transmissions disconnect battery cables and remove ignition key from the switch.**

**⚠ CAUTION**

**Most Twin Disc products have provisions for attaching lifting bolts. The holes provided are always of adequate size and number to safely lift the Twin Disc product. These lifting points must not be used to lift the complete power unit. Lifting excessive loads at these points could cause failure at the lift point (or points) and result in damage or personal injury.**

**⚠ CAUTION**

**Select lifting eyebolts to obtain maximum thread engagement with bolt shoulder tight against housing. Bolts should be near but should not contact bottom of bolt hole.**

## 1.3 Preventative Maintenance

Frequent reference to the information provided in the operator's manual regarding daily operation and limitations of this equipment will assist in obtaining trouble-free operation. Schedules are provided for the recommended maintenance of the equipment, and if observed, minimum repairs, aside from normal wear, will result. See Section 4, Maintenance and Specifications.

## 1.4 Replacement Parts

**⚠ WARNING**

**All replacement parts or products (including tubes, hoses and fittings) must be of Twin Disc origin or equal, and otherwise identical with components of the original equipment. Use of any other parts or products will void the warranty and may result in malfunction or accident, causing injury to personnel and/or serious damage to the equipment.**

Renewal Parts and Service Parts Kits may be obtained from any authorized Twin Disc distributor or service dealer. They can be found under POWER TRANSMISSION EQUIPMENT in the Yellow Pages of most metropolitan telephone directories, or contact Twin Disc for the nearest distributor.

**NOTE:** Do not order parts from the part numbers on the cross-sectional drawings. These numbers may be referenced for part identification; however, they should be verified on the bill of material (BOM) before an order is placed. BOM numbers are stamped on the unit nameplate.

Follow these instructions to order parts:

1. Specify the model, bill of material, and serial number of the unit involved. These numbers are stamped on the unit's nameplate.
2. State exactly each item required using the part number from the BOM.
3. Specify the quantity of each part required.

4. Furnish the complete shipping destination and postal address. All parts shipments made from the factory will be F.O.B. factory location, U.S.A.
5. State specifically whether the parts are to be shipped by freight, express, etc. If shipping instructions are not specified on the order, the equipment will be shipped the best way, considering time and expense. Twin Disc, Incorporated will not be responsible for any charges incurred by this procedure.

Twin Disc, Incorporated, having stipulated the bill of material number of the unit's nameplate, absolves itself of any responsibility resulting from any external, internal, or installation changes made in the field without the express written approval of Twin Disc. All returned parts, new or old, emanating from any of the above stated changes will not be accepted for credit. Furthermore, any equipment that has been subjected to such changes will not be covered by a Twin Disc Warranty.

## 1.5 Source of Service Information

This manual is current at the time of printing. When required, changes are made to reflect advancing technology and improvements in state of the art.

Individual product service bulletins are issued to provide the field with immediate notice of new service information. These service bulletins are distributed to all Twin Disc distributors throughout the United States and in many foreign countries.

For the latest service information on Twin Disc products, contact any Twin Disc distributor.

## 1.6 Warranty

Twin Disc marine transmissions have a warranty, which can be found at the front of this manual. For details of the warranty, contact any Twin Disc distributor, service dealer, or the Warranty Administration Department, Twin Disc, Incorporated, Racine, Wisconsin, U.S.A.

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Section 2

# Description

## 2.1 General

1. The MG-5200 series transmission can be operated through either the primary shaft or secondary shaft at its full rated horsepower.
2. The model MG-5202SC marine transmission is manufactured in both English and metric dimensions. Check the bill of material (BOM) for applicable drawings and parts listings.
3. Transmission clutches are hydraulically applied using main oil pressure. All bearings, clutches and gears are lubricated and cooled with low-pressure oil.

## 2.2 Direction of Drive

Input power to the transmission is through a torsional coupling mounted on the engine flywheel. The coupling is splined to the forward end of the primary shaft causing the primary shaft to rotate in engine direction. Power is transmitted to the secondary shaft through transfer gear teeth on the outer diameter (O.D.) of the primary clutch housing. These teeth are in mesh with gear teeth on the O.D. of the secondary clutch housing causing the secondary shaft to rotate in anti-engine direction. The primary and secondary pinions on their respective shafts are in constant mesh with the output gear, which is connected to the output shaft through a keyless tapered joint.

Application of the primary clutch locks the primary pinion to the primary shaft causing the pinion to turn in shaft direction and causing the output shaft to rotate in anti-engine direction. Application of the secondary clutch locks the secondary pinion to the secondary shaft causing the pinion to turn in shaft direction and causing the output shaft to rotate in engine direction.

## 2.3 Construction Features

### A. Housings

The MG-5200 series transmission has a one-piece main housing. Front housing sizes in SAE No. 0 and SAE No. 1 sizes are available. A top cover, bearing carrier, rear manifold (sealed with gaskets) completes the housing enclosure.

### B. Primary and Secondary Pinion and Shaft Bearings

The primary and secondary clutch shafts and pinions are supported and located by a combination of straight and tapered roller bearings. Bearing clearances for each clutch shaft and pinion are set by use of a single shim pack at the rear tapered roller bearing on each shaft. Tapered roller bearings also support the output shaft and have bearing clearance adjusted by use of shims.

### C. Oil Pump Drive

The oil pump is tang driven by the secondary clutch shaft.

### D. Lubrication Features

The MG-5200 series transmission has a lubrication tube located inside the main housing. The tube extends from the front to the rear of the inside of the housing. The lubrication tube has drilled holes in the tube that spray oil on the transfer gears and the primary and secondary pinions. Bearings and clutches on the primary and secondary shafts are lubricated through drillings in the shafts. Output shaft bearings are gravity and splash lubricated.

### E. Suction Strainer

The unit has a suction strainer located below the oil pump. The strainer is between the sump and oil pump in the hydraulic circuit.

### F. Filter Assembly

A spin-on filter is located between the heat exchanger inlet and the selector valve in the hydraulic circuit.

### G. Gears

All gears are helical, carburized, hardened and ground for smooth quiet operation. All gears are in constant mesh. The primary and secondary transfer gears and the output gear are mounted on keyless tapers.

### H. Flexible Input Coupling

The purpose of the torsional coupling is to transmit power from the engine to the marine transmission through a rubber or silicone element that will:

a. Dampen torsional vibrations.

b. Change the natural frequencies of a system to move critical frequencies out of the operating speed range.

c. Accommodate a certain amount of misalignment.

d. Absorb shock and reduce noise.

e. Minimize gear “rattle.”

## I. Heat Exchanger

The heat exchanger is designed to maintain the oil in the hydraulic system of the marine transmission at the proper temperature by passing coolant from the engine through the heat exchanger. The heat exchanger should be installed in a location convenient to both engine coolant and marine transmission oil.

## J. Trolling Valve (Optional)

The trolling valve is used to reduce and control propeller speed below that normally attained by operating the engine at low idle. Actuating the trolling function reduces clutch apply pressure, allowing the clutch plates to slip to reduce the propeller speed.

## K. PTO (Optional)

The PTO is used to power accessories using horsepower from the engine. The PTO accepts a SAE 4 pump. Two types of PTO's are available: a live PTO, and a hydraulic clutched PTO.

### Live PTO

The live PTO rotates in the same direction as the engine, at engine speed, all of the time. This PTO is a direct connection to the primary shaft of the marine transmission.

### Hydraulic Clutched PTO

The hydraulic clutched PTO is connected to the primary shaft of the transmission. When oil pressure is applied to the clutch, the PTO rotates in the same direction as the engine and at engine speed. When the clutch does not have oil pressure appled to it, the PTO does not transmit power.

## L. Trailing Pump (Optional)

The trailing pump supplies oil to the lubrication circuit of the transmission for windmilling (backdriving) situations. This remote mounted pump with oil to air heat exchanger, is electrically powered.

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Section 3

# Operation

## 3.1 General

The control valve obtains primary, neutral and secondary positions. When these positions are selected, the control valve directs high-pressure oil through internal passages to operate the clutches.

## 3.2 Hydraulic System

The oil pump draws oil through the strainer from the oil sump and discharges it through the filter to the combination control and pressure-regulating valve. The oil enters the pressure-regulating area of the valve where main pressure is regulated by cascading excess oil into the heat exchanger to the lubrication oil circuit. Lubrication oil is distributed through fixed controlled orifices to lubricate and cool the clutches and bearings. There is a lubrication oil relief valve to limit the maximum lubrication oil pressure to approximately 100 psi.

In Neutral, the inlet port of both clutches is connected to the atmosphere. Since the area behind the clutch pistons is open to sump, the clutches are disengaged. Oil is distributed through the lubrication system.

When the control valve is shifted to engage either clutch, the valve directs main pressure to engage the selected clutch pack. Oil is also directed to move the rate-of-rise piston, compressing the pressure regulator springs. This progressively increases the clutch engaging pressure causing the clutches to engage at a controlled rate.

The control valve allows only one clutch to be engaged at a time, and the oil from the disengaged clutch is connected to vented to sump (atmospheric pressure). The clutch return springs move the disengaged clutch's clutch piston to the disengaged position preventing clutch drag.

## 3.3 Manual Control Valve Assembly

### A. General

The control valve assembly contains passages and ports to direct pressurized oil within the transmission's hydraulic system. The pressure-rate control piston within the control valve assembly provides a rapid, smooth, oil pressure increase in the hydraulic system during clutch engagement.

### B. Manual Control Valve — Neutral

Oil enters the control valve body through passage A and fills chamber B. The oil causes the pressure regulating piston to partially compress the piston outer and inner springs against the pressure-rate control piston. This pressurizes the oil in chamber B. This pressure varies with engine speed.

The movement of the pressure regulation piston against the springs exposes port C in the valve body. Port C directs overage oil to the lubrication oil circuit. Passage D (which is the engaging outlet to the primary clutch) and Passage E (which is the engaging outlet to the secondary clutch) are interconnected by slot F in the control valve stem when in the neutral position. The slot is aligned with a drilled hole and cored cavity in the face of the valve body. The drilled hole and cored cavity are aligned and drilled holes that pass through the main housing to sump. Therefore, passages D and E are at atmospheric pressure at this time. Also, passage J is at atmospheric pressure because port H interconnects with slot F. This area between pistons and around springs is vented to the sump of the transmission. This area is at atmospheric pressure at all times permitting the return to sump of any leakage oil past the pistons.

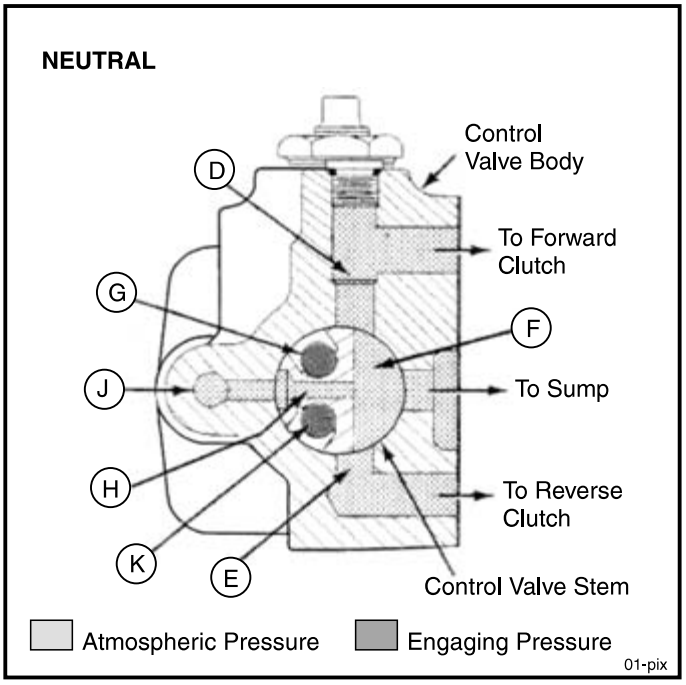



**Fig. 3.1 Manual Control Valve — Neutral — Sectional View**

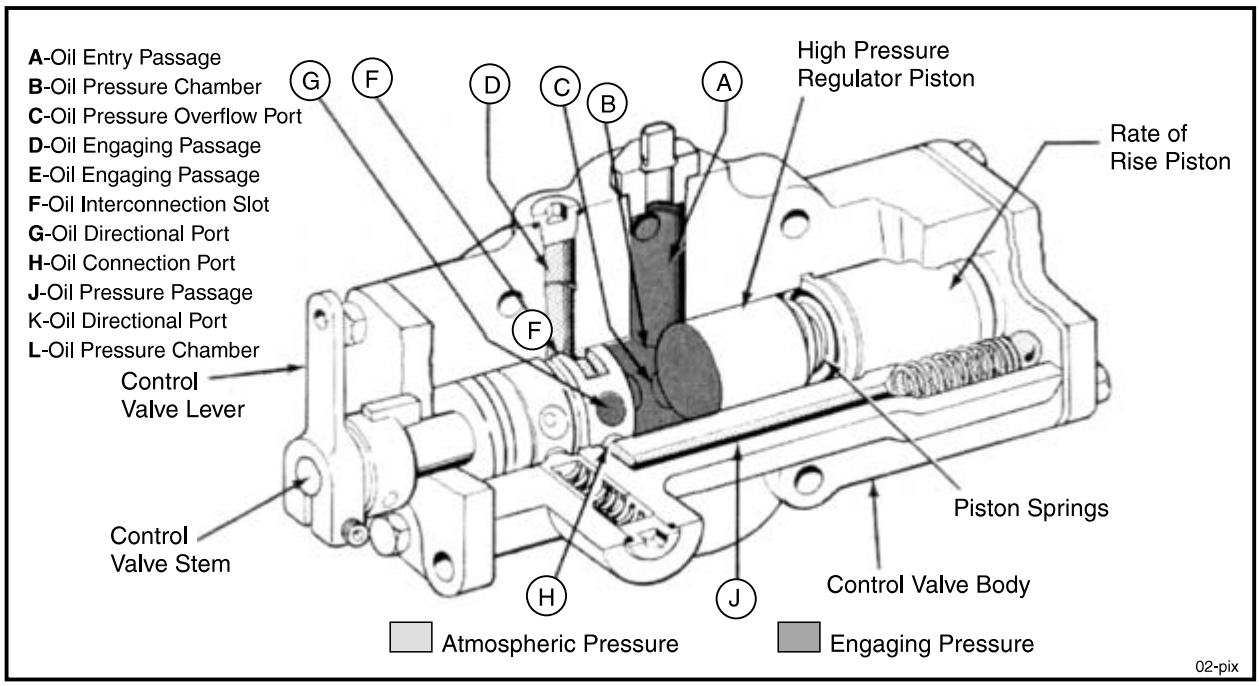



**Fig. 3.2 Manual Control Valve — Neutral — Cutaway View**

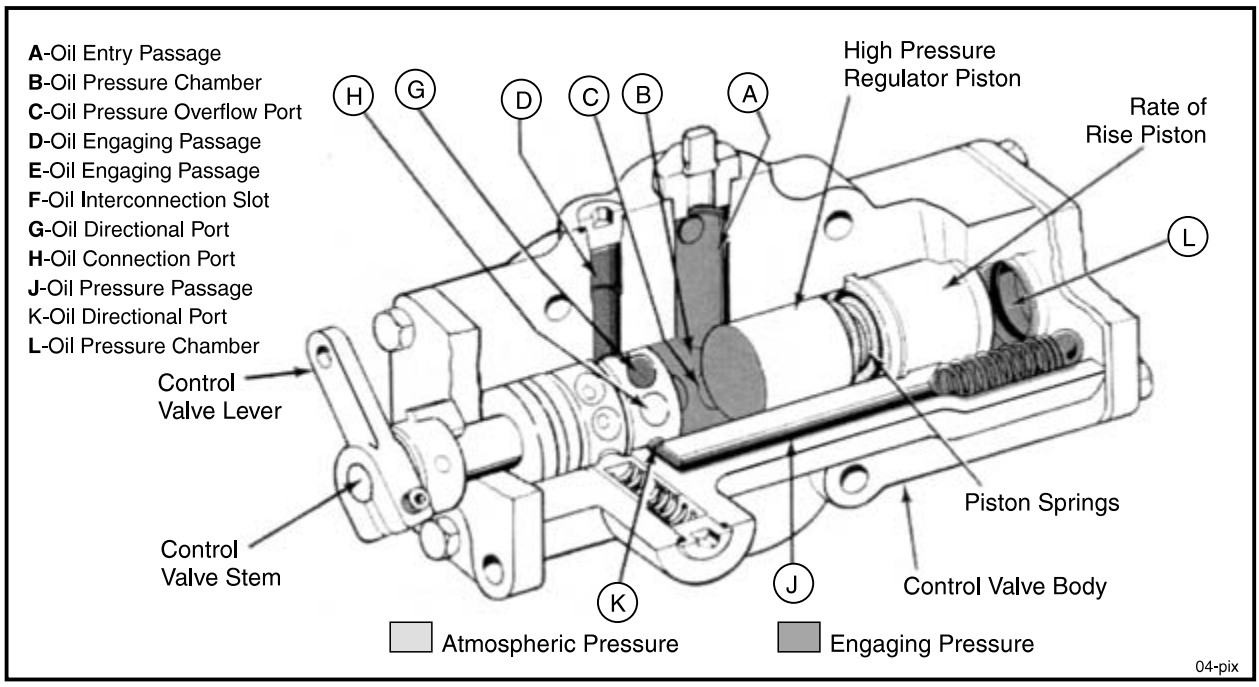



**Fig. 3-4 Control Valve — Primary — Cutaway View**

### D. Manual Control Valve — Secondary

When a shift to the secondary position is desired, the control valve lever is moved. The shift causes the control valve stem to rotate and assume the position indicated in Figures 3-5 and 3-6. The pressurized oil in chamber B is directed through ports G and K to passages E and J. Passage E is aligned with a passage directing main pressure to the secondary clutch. Pressurized oil from port G travels through passage J and enters chamber L through an orifice in the orifice plate.

The orifice in the pate meters the oil for a steady, smooth pressure rise in chamber L. As chamber L fills with oil, the pressure rate control piston moves against springs until the piston is stopped by a shoulder in the valve body. The causes the pressure in chamber B to rise to clutch engaging pressure.

When in secondary, passage D remains at atmospheric pressure because slot F remains open to sump. When a shift is made from secondary to neutral, the valve stem is rotated to the position illustrated by Figures 3-1 and 3-2. Under these conditions, passage E is connected to the sump by slot F. Passage J is also connected to sump by port H in the valve stem. Because passage E is connected to slot F, oil drains rapidly from the secondary clutch to sump. Because passage J is now at atmospheric pressure, the oil pressure in chamber L unseats the steel ball against the compression spring, permitting a rapid oil drain from chamber L to sump and allowing the pressure rate control piston to move back against the orifice plate. The secondary clutch is now disengaged and main system pressure reduced to neutral pressure.

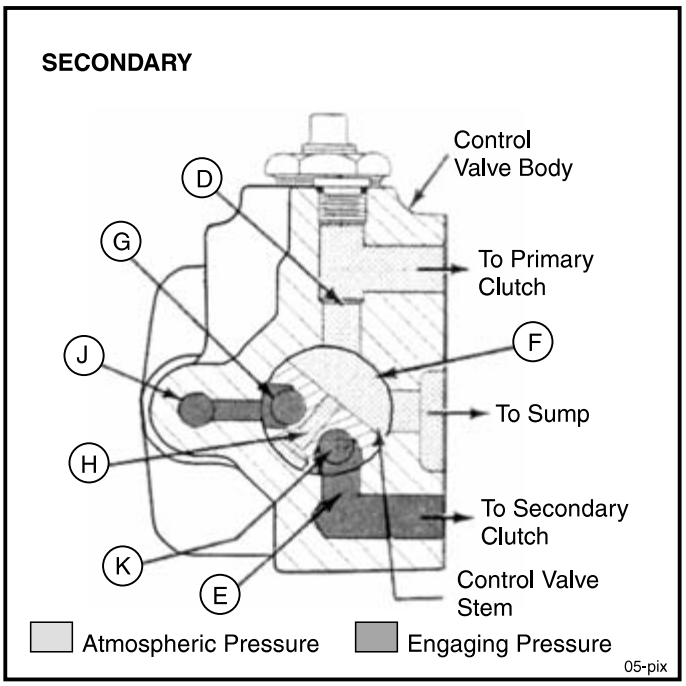



**Fig. 3.5 Control Valve — Secondary — Sectional View**

### C. Manual Control Valve — Primary

When a shift to the primary position is desired, the control valve lever is moved. The shift causes the control valve stem to rotate and assume the position indicated in Figures 3-3 and 3-4. The pressurized oil in chamber B is directed through ports G and K to passages D and J. Passage D is aligned with a passage directing main pressure oil to the primary clutch. Pressurized oil from port K travels through passage J and enters chamber L through an orifice in the orifice plate. The orifice in this plate meters the oil for a steady, smooth pressure rise in chamber L. As chamber L fills with oil, the pressure rate-control piston moves against the springs until the piston is stopped by a shoulder in the valve body. This causes the pressure in chamber B to rise to clutch engaging pressure. When in primary, passage E remains at atmospheric pressure because slot F remains open to sump.

When a shift is made from primary to neutral, the valve stem is rotated to the position illustrated by Figures 3-1 and 3-2. Under these conditions, passage D is connected to sump by slot F. Passage J also is connected to sump by port H in the valve stem. Because passage D is connected to slot F, oil drains rapidly from the primary clutch to sump. Because passage J is now at atmospheric pressure, the oil pressure in chamber L unseats the steel ball against the compression spring permitting a rapid oil drain from chamber L to sump and allowing the pressure-rate control piston to move back against the orifice plate. The primary clutch is now disengaged and main system pressure reduced to neutral pressure.

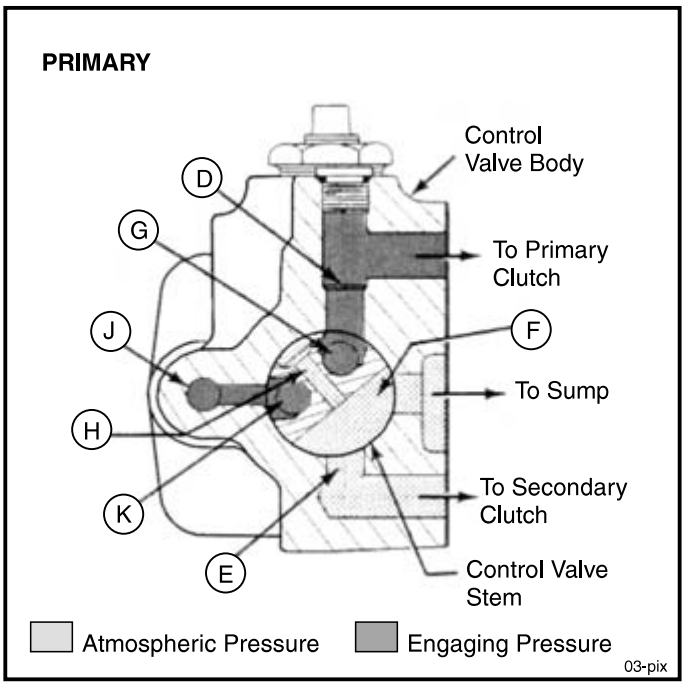



**Fig. 3.3 Control Valve — Primary — Sectional View**

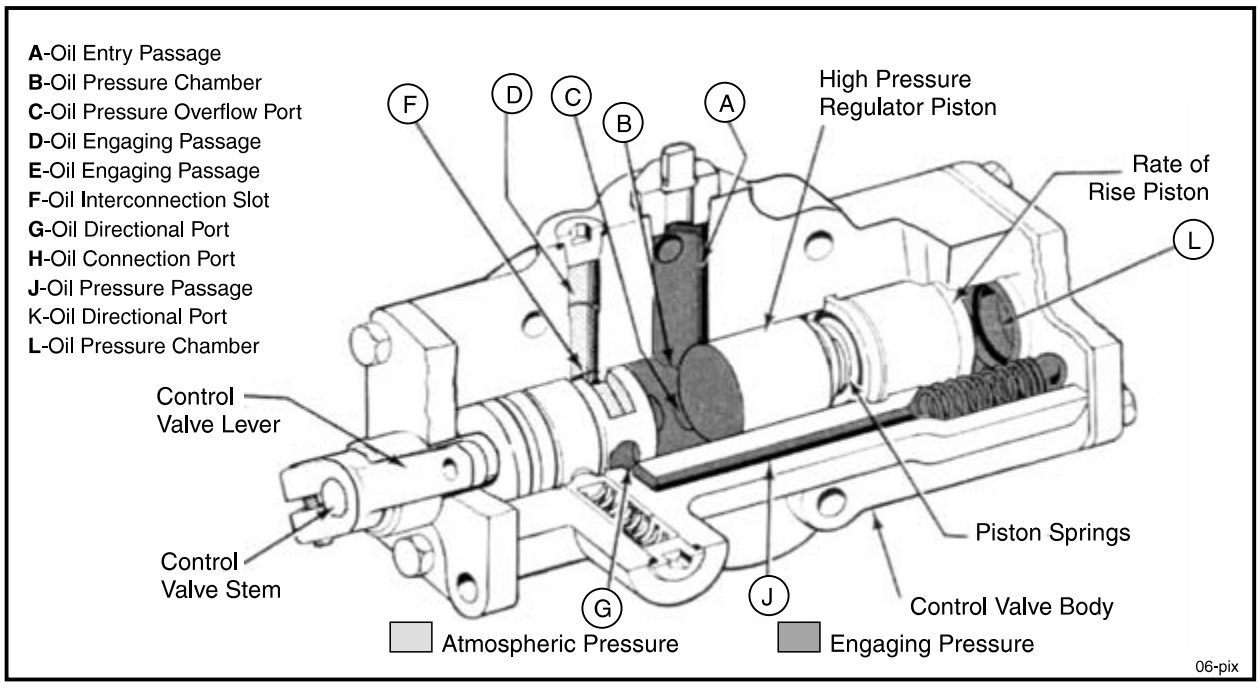


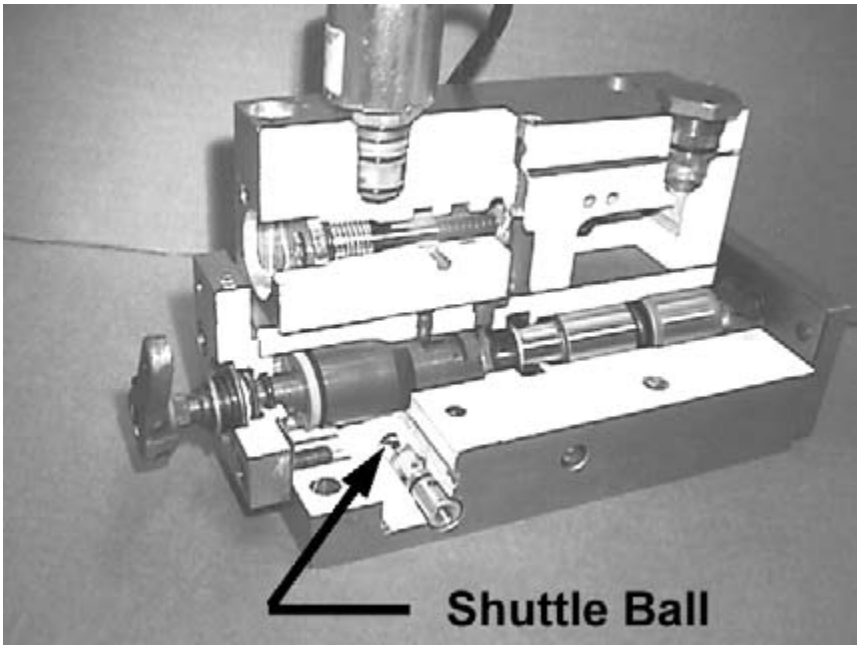

**Fig. 3.6 Control Valve — Secondary — Cutaway View**

## 3.4 Electric Control Valve Assembly

### A. General

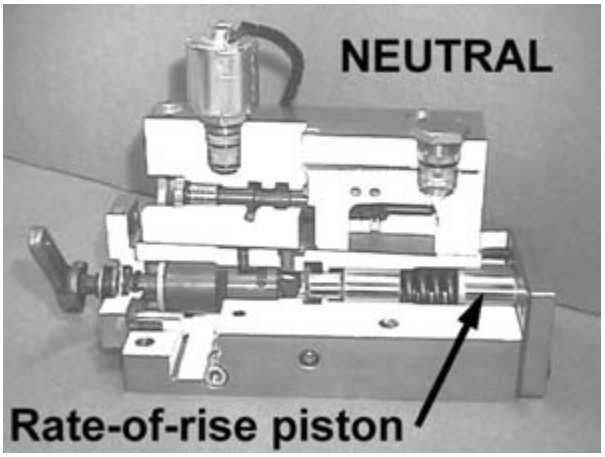
Oil is pumped from the sump of the transmission and forced through the oil filter. Filtered oil enters the control valve through the inlet port . The incoming oil forces the pressure regulator piston against the springs to open the path to the lubrication circuit. Oil not used for clutch engagement flows past the regulator piston to become lubrication oil. Lubrication oil flows through the heat exchanger to the lubrication oil circuit in the transmission to lubricate and cool the clutches and bearings. There is a lubrication oil pressure relief valve in the transmission to limit maximum lubrication oil pressure to approximately 100 psi. The area between the pressure regulating piston and the rate-of-rise piston is connected to sump at all times to prevent any leakage oil from affecting the pressure regulation.

The pressure in the rate-of-rise chamber is controlled by a ball that is spring loaded against the orifice plate. The passage behind the ball and spring is connected to the atmosphere in Neutral and to main pressure when either clutch is engaged. A shuttle ball connected to both clutch pressure ports permits pressurizing this passage with oil from the engaged clutch without allowing oil to flow to the disengaged clutch.

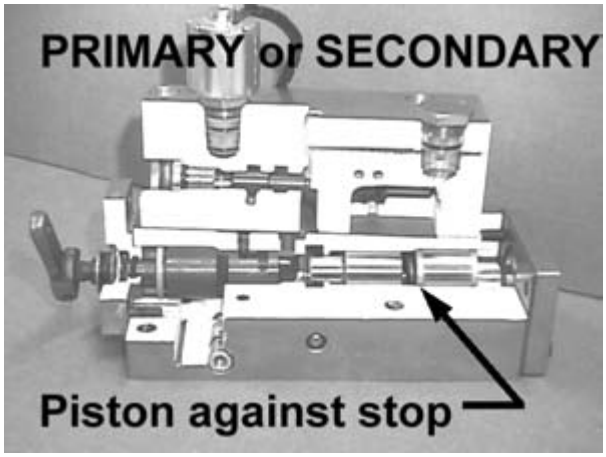



**Mvc-001**

forces the rate-of-rise piston to stroke over to its stop in the valve body, compressing the pressure regulating springs even further yet.




Mvc-003a



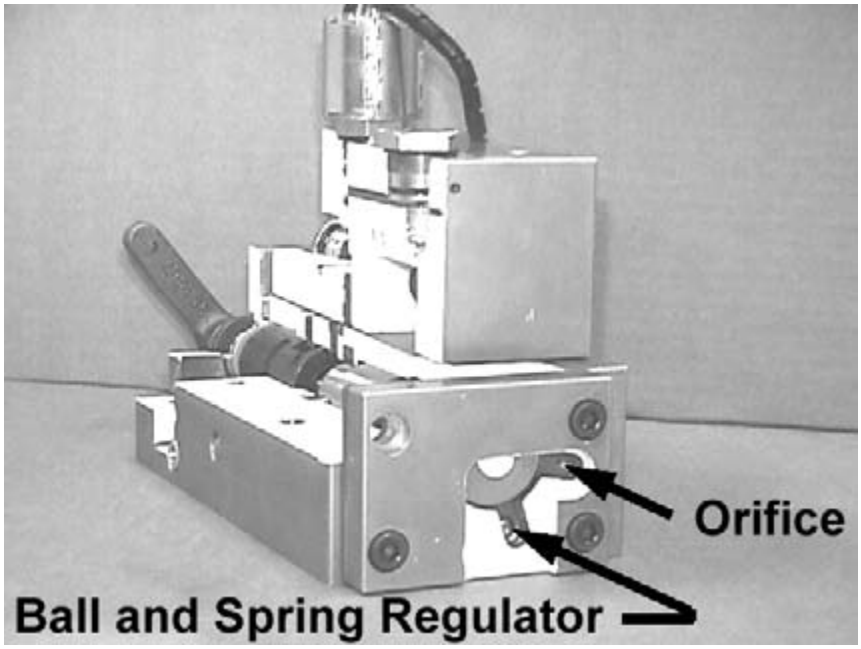

Mvc-004a

The travel rate of the rate-of-rise piston (and resulting pressure rate-of-rise) is controlled by the orifice size, regulator spring stiffness and the final main pressure after completion of the rate-of-rise cycle. Neutral main pressure controls the start time of the rate-of-rise cycle. When the rate-of-rise piston is against the stop (pressure regulating springs are compressed the most), the main oil pressure reaches approximately 250 psi.

When the control valve is shifted to Neutral, the clutch that was engaged is vented to sump within the valve. As a result, the passage behind the ball and spring regulator is vented to sump and induces a high differential pressure between the rate-of-rise chamber and the passage behind the ball and spring. Since the pressure in the rate-of-rise chamber is much greater than the pressure it is to be regulated at, the ball unseats from the orifice plate, allowing main oil pressure to return to the neutral pressure level rapidly and again be regulated by the ball and spring regulator. The ball returns to the pressure regulating position once the spring force is equal to force induced by the pressure at the rate-of-rise piston.

### B. Electric Control Valve Assembly - Neutral

Some of the main pressure oil from the oil inlet chamber flows through a passage to the orifice in the orifice plate. The small flow of oil through this orifice fills and begins to pressurize the rate-of-rise chamber.




**Mvc-002a**

Both clutches are connected to sump when the control valve is in Neutral. Since there is no pressure acting on the shuttle ball from either clutch, the passage behind the ball and spring regulator is also connected to sump. This allows the oil pressure in the rate-of-rise chamber to be regulated by the ball and spring, since the overage oil can flow to sump. The oil pressure in the rate-of-rise chamber acting on the rate-of-rise piston causes it to stroke over partially, which compresses the pressure regulating springs additionally.

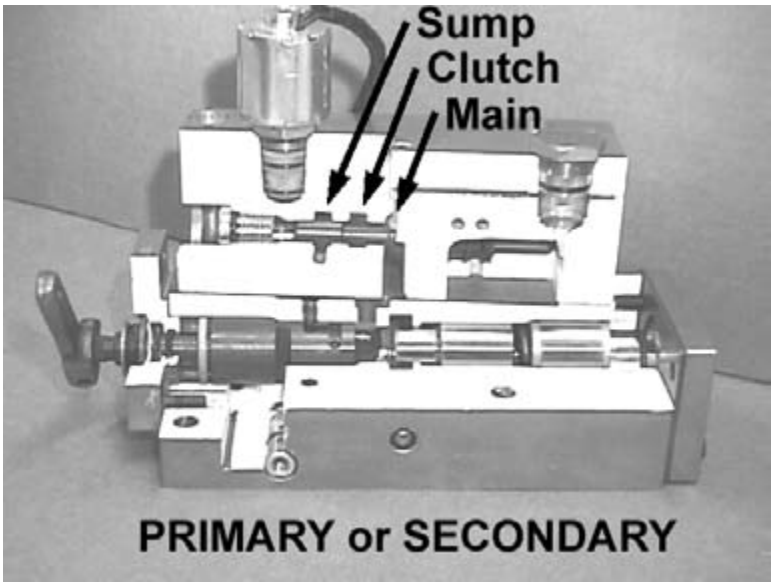
This additional spring compression further resists the movement of the pressure regulating piston, resulting in a force balance between the area at the pressure regulator, the springs, and the area behind the rate-of-rise piston. Neutral main pressure of approximately 40 psi is maintained by relieving excess oil behind the rate-of rise piston through the ball and spring regulator.

### C. Electric Control Valve Assembly - Primary or Secondary

Pressurized oil is directed to one of the transmission's clutches to engage it. The pressurized oil in the clutch port of the engaged clutch acts on the shuttle ball, sealing off the passage to the opposite clutch. The pressurized oil also forces the ball of the ball and spring regulator against its seat on the orifice plate, stopping the flow of oil from the rate-of-rise chamber to sump. Since oil continues to flow into the rate-of-rise chamber through the orifice, the oil pressure in the rate-of-rise chamber increases. This increased oil pressure

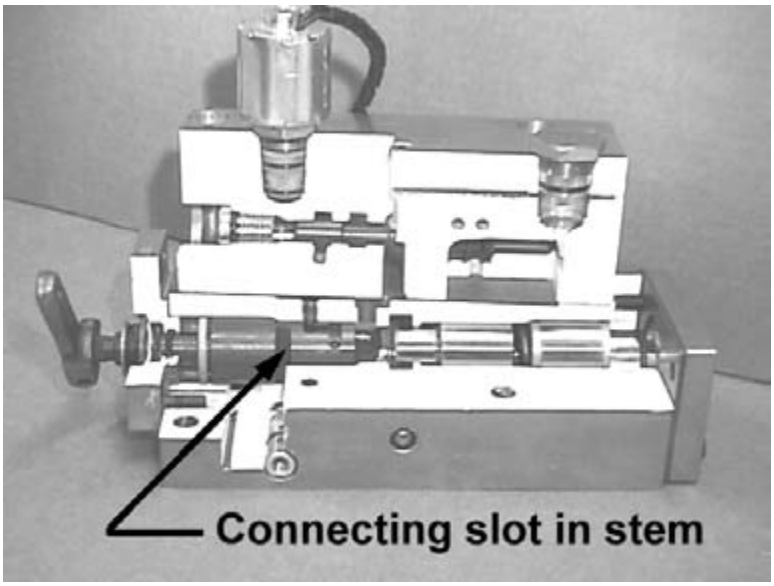
## D. Electric Operation

The transmission normally operates with the control valve in the electric mode. Two spools, each controlled by a solenoid operated pilot valve, control clutch engagement. When a solenoid is energized, it opens the pilot valve and allows main pressure oil to flow to the end of the spool. The pressure acting on the end of the spool overcomes the return spring at the opposite end, causing the spool to stroke over and connect the clutch passage with main pressure passage.




**Mvc-006a**

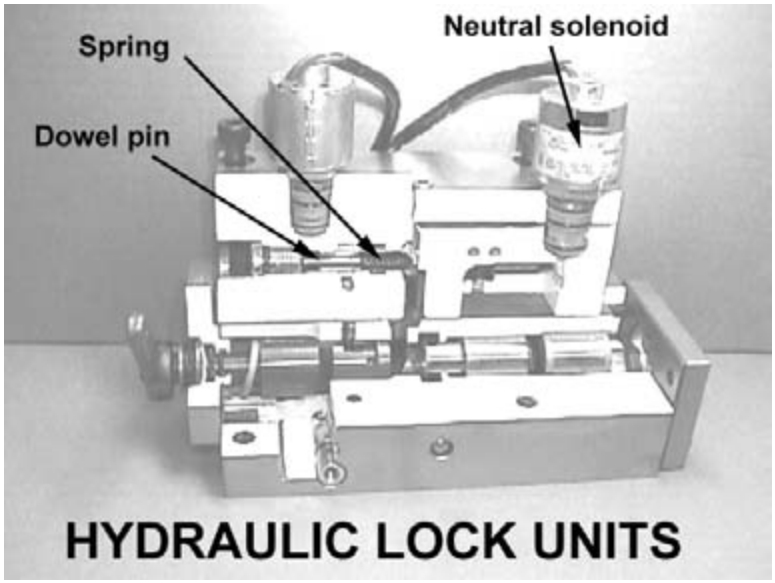
Main pressure oil flows from the spools above to the clutch passages of the transmission below via connecting slots in the manual override stem. These connecting slots are aligned with passages in the valve body when the valve is in the electric mode.




**Mvc-006b**

Main pressure from the energized solenoid operated pilot valve also acts on a pin on the return spring side of the opposite spool to ensure the opposite spool is connecting its clutch to sump. The clutch engagement cycle is outlined in the previous section.

*Hydraulic Lock Feature (some models)*
Some control valve models have a hydraulic lock feature, and are identifiable by a third solenoid operated pilot valve. This feature keeps the engaged clutch pressurized as long as the engine remains running, should electrical power fail or malfunction occur while the clutch is engaged. The hydraulic lock is accomplished by allowing pressurized oil (from the pressurized clutch passage) to flow inside the spool. Oil pressure inside the spool forces the dowel pin against the O-ring plug.

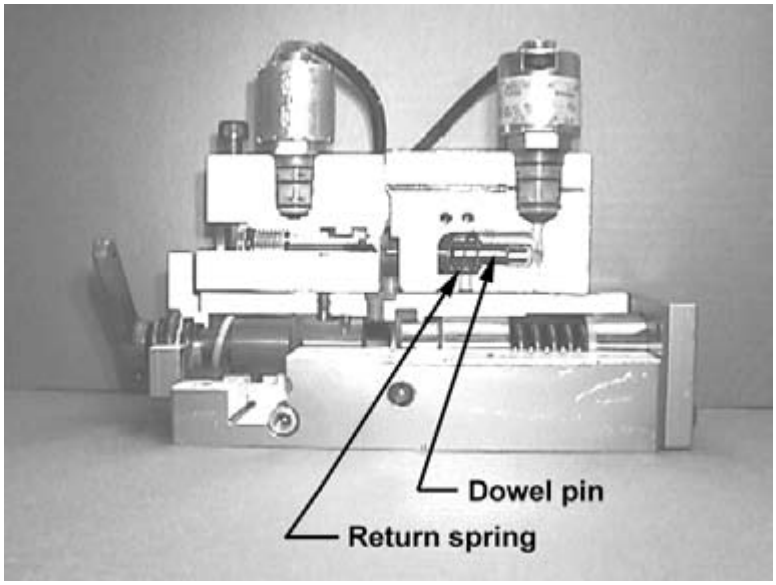



**Mvc-010a**

The resulting reaction is a force on the spool that overcomes the spool's return spring force. Should the solenoid become de-energized while the spool has its clutch pressurized, oil pressure will keep the spool in that position. This keeps the transmission in gear as long as the engine is running.

The hydraulic lock is disabled when either the engine is stopped, or the neutral solenoid is energized. When the neutral solenoid is energized, it sends pressurized oil to the dowel pins at the return spring end of each spool.

Since the dowel pin used at the return spring side of the spool is larger in diameter than the dowel pin inside the spool, the hydraulic force acting on the larger pin forces the spool to connect the clutch passage to sump with assistance from the return spring.

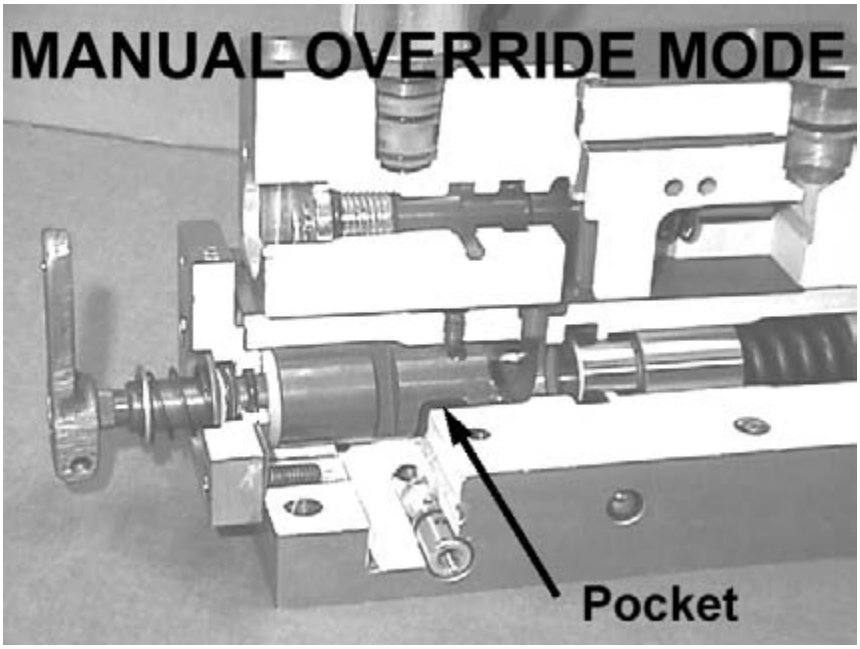



**Mvc-012a**

## E. Manual Override Operation

The control valve has a manual override feature, which is a lever operated selector. When the manual override lever is rotated counterclockwise and pulled outwards, the upper portion of the valve is disabled because the connecting slots in the manual override stem are no longer aligned with the oil passages in the valve body. Oil pressure from the solenoid operated pilot valve controlled spools cannot reach the clutch pressure passages in the transmission. The main oil pressure regulator, shuttle ball, neutral pressure regulator, and rate-of-rise functions remain exactly the same as when the valve is in the electric mode. In the manual override position, shifting is controlled by rotating the lever on the manual override stem.

In the Neutral position, both clutches are vented to sump by two pockets in the stem.




**Mvc-013a**

Main pressure oil can flow through the hole in the end of the stem to a narrow slot between the two pockets. This slot does not connect to any other passages when the stem is in the Neutral position.

When the lever and stem are rotated to engage either the primary or secondary clutch, main pressure oil flows through the slot in the stem to the appropriate clutch pressure port. The opposite clutch port passage remains connected to sump by the same pocket in the stem as when the stem was in the Neutral position. When the stem is rotated back to the Neutral position, the main pressure oil slot in the stem is no longer aligned with either clutch port. Both clutches are again vented to sump by the two pockets in the stem.

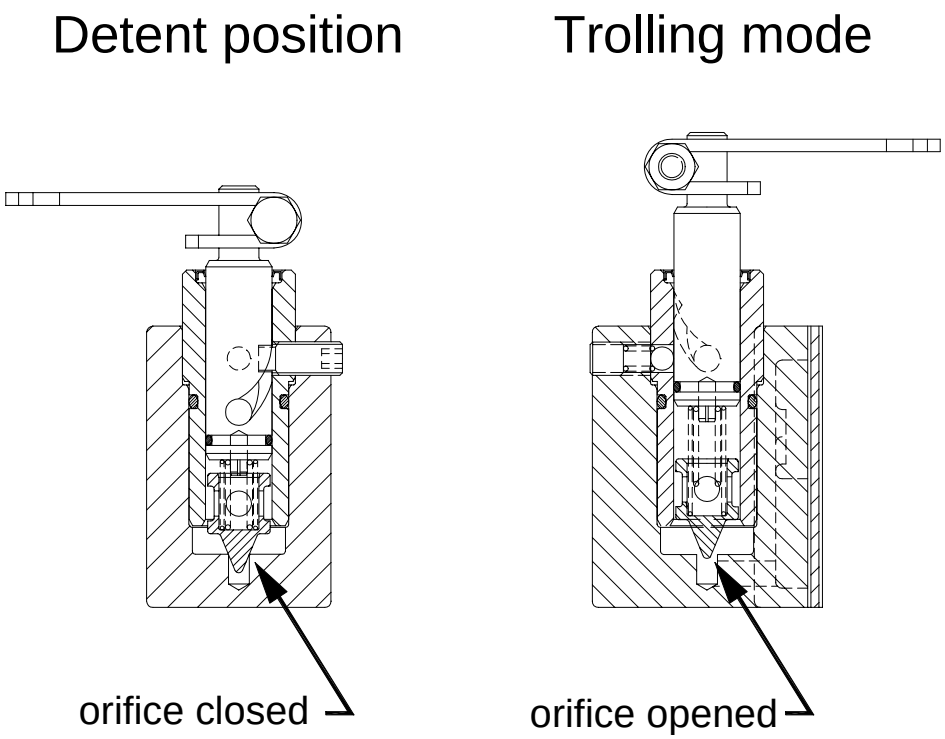
## 3.5 Trolling Valve (Optional)

The trolling valve is used to reduce and control propeller speed below that normally attained by operating the engine at low idle. Actuating the trolling function reduces clutch apply pressure to reduce the propeller speed.

### A. 1017555 Trolling Valve (manual)

This trolling valve is a variable orifice that controls the pressure in the rate-of-rise chamber. The pressure in the rate-of-rise chamber determines the rate-of-rise piston position, which ultimately controls the main and clutch pressures for the transmission.

When the trolling valve lever is in the detent (non-trolling) position, the orifice in the trolling valve is closed. Oil cannot exit from the rate-of-rise chamber through the trolling valve's orifice, and the rate-of-rise chamber is fully pressurized (the ball and spring regulator is blocked when either clutch is engaged). This full pressure causes the rate-of-rise piston to remain against its stop in the valve body bore, and main oil pressure is not reduced.




**1017555-1**

Rotating the trolling valve lever into the trolling mode opens the variable orifice, allowing some of the oil to escape from the rate-of-rise chamber to sump. This reduces the oil pressure in the rate-of-rise chamber. Since oil is always flowing into the rate-of-rise chamber through the orifice in the orifice plate, the pressure in the rate-of-rise chamber is controlled by how much oil is allowed to exit through the trolling valve's variable orifice. The

trolling valve lever position determines the pressure in the rate-of-rise chamber, which determines main oil pressure. Main oil pressure is always the same as the oil pressure in the engaged clutch with this type of trolling valve.

## 3.6 Live PTO (Optional)

The live PTO drives accessories using engine horsepower. Since the live PTO connects the accessory to the primary shaft of the transmission via a direct coupling, the accessory is driven when the engine is running.

## 3.7 Hydraulic Clutched PTO (Optional)

The hydraulic clutched PTO also allows accessories to be driven using engine horsepower. Since the PTO is attached to the primary shaft of the transmission, the accessories can be driven any time the engine is running. The PTO is engaged by rotating the lever of the PTO control valve.

The hydraulic clutched PTO operates with an engaged clutch pressure greater than that of the transmission's primary and secondary clutches. For this reason, the PTO control valve (pressure increasing valve) is in the transmission's hydraulic circuit before the control valve's inlet and pressure regulator. Pressurized oil from the filter is directed to the PTO control valve, with the overage oil flowing to the transmission's control valve.

## 3.8 Trailing Pump (Optional)

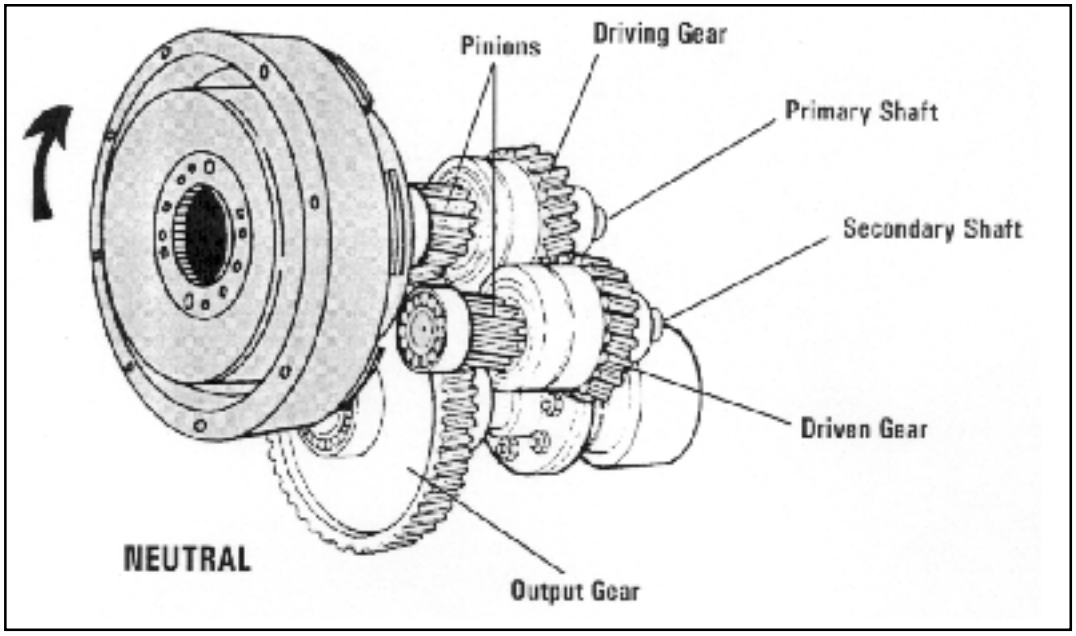
The trailing pump supplies oil flow to the transmission lubrication circuit when the output shaft is rotating. This lubrication oil is required when the transmission is in a backdriving condition. Backdriving (sometimes referred to "windmilling") occurs when the engine is shut down and the transmission output shaft is being driven by water flow across the propeller. When the engine is running and the output shaft is rotating, oil flow from the trailing pump supplements the oil flow supplied to the lubrication circuit by the main oil pump.

The trailing pump is driven by an electric motor, and oil flow from the trailing pump flows through a check valve into the oil inlet of the heat exchanger and into the transmission lubrication circuit.

## 3.9 Power Flow

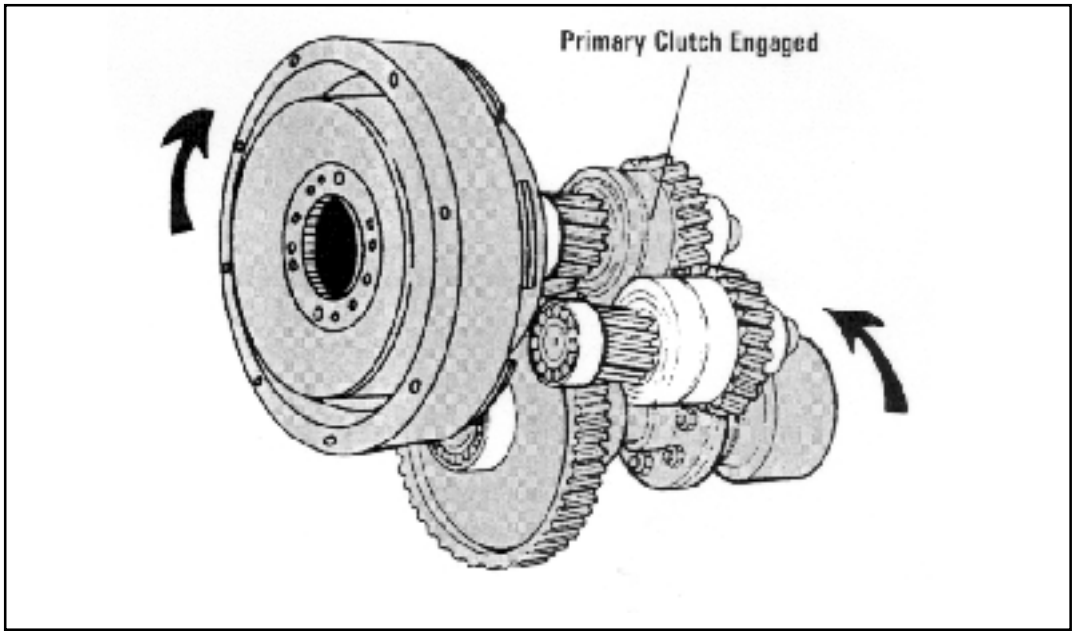
### A. Neutral

When in neutral the primary and secondary shafts, transfer gears and clutch friction plates rotate at engine speed. Other parts including the output shaft do not turn.



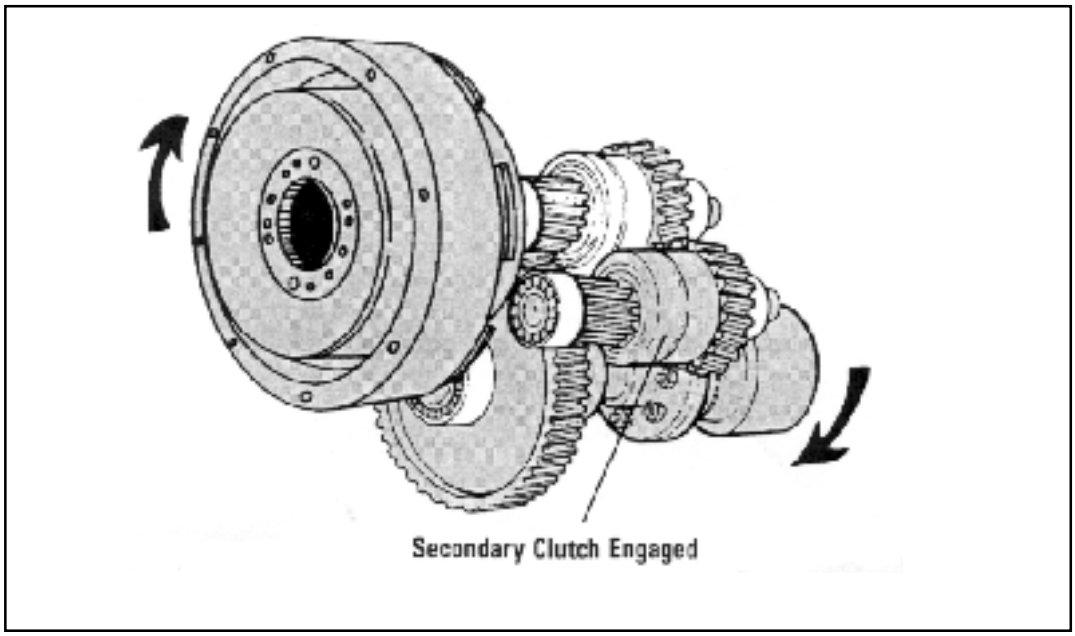
### B. Primary

When the primary position is selected, hydraulic pressure is applied to the primary clutch piston clamping the friction and steel clutch plates together. The primary input pinion will then rotate at engine speed and direction because the steel plates are spline-connected through the clutch hub assembly to the pinion. Because the primary input pinion is in mesh with the output gear, the output gear and shaft will rotate in anti-engine direction. The secondary input pinion will be backdriven (engine direction) when the unit is in the primary position.



### C. Secondary

In secondary, the same pans are turning that were turning in neutral. When the secondary position is selected, hydraulic pressure is applied to the secondary clutch piston clamping the friction and steel plates together. The secondary input pinion will then rotate at engine speed and anti-engine direction, because the steel clutch plates are spline connected through the clutch hub assembly to the input pinion. Because the secondary input pinion is in mesh with the output gear, the output gear and shaft will rotate in engine direction. The primary input pinion will be backdriven (anti-engine direction) when the unit is in the secondary position.



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Section 4

# Specifications and Maintenance

## 4.1 Specifications

Frequent reference to this data and application of the information will result in better service from the transmission.

### A. Oil Capacity

26.5 liters (7.0 U.S. gal.) for shallow case models, 31.4 liters (8.3 U.S. gal.) for deep case models, plus hoses and heat exchanger. The transmission should be warmed to operating temperature when oil is checked.

### B. Oil Pump Capacity

88 lpm, (23.2 gpm) at 2,300 rpm.

### C. Minimum Oil Pressure When Cruising

Check transmission identification plate.

### D. Maximum Input Speed

Maximum input speed is dependent on the input coupling. Refer to transmission's installation drawing.

### E. Dry Weight

| WEIGHT | MODEL NUMBER |
|---|---|
| 578 kg (1,292 lbs) | MG-5202SC (DRAWING NUMBERS 1014841, 1015389) |
| 580 kg (1,275 lbs) | MG-5202SC (DRAWING NUMBER 1016103, 1016103A, 1016103B) |
| 931 kg (2,052 lbs) | MG-5202DC (DRAWING NUMBER 1015207) |
| 1032 kg (2,275 lbs) | MG-5202DC (DRAWING NUMBER 1015207A) |
| 409 kg (900 lbs) | MG-5203SC, MG-5204SC (DRAWING NUMBERS 1016249, 1016250, 1016250A) |

T-5202-03

## F. Type Oil Recommended

The recommended oil viscosity for this unit is SAE 40W or SAE 50W, depending on operating temperature. Use only SAE-API service class CD engine oil certified by vendor to pass TO-2 or C-3 test specifications. Also approved is SAE-API service class CC engine oil, MIL-L-2104B.

**NOTE**: Multi-viscosity oils (i.e., 10W-20, etc.) should *not* be used in Twin Disc marine transmissions.

## 7G. Oil Pressure

The following tables give oil pressures at different speeds and ranges. See the installation print for location of oil pressure checkpoints.

**Oil Pressure Limits - 1586 kPa (230 psi) units** (215 psi minimum pressure when cruising)

| Input RPM & Shift Position | X Valve Inlet | | $Z_{PC}$ Primary Collector | | $Z_{SC}$ Secondary Collector | | G Lube | |
|---|---|---|---|---|---|---|---|---|
| | kPa min./max. | psi min./max. | Kpa min. | psi min. | Kpa min. | psi min. | kPa min./max. | psi min./max. |
| **1800** | | | | | | | | |
| Primary | 1572/1634 | 228/237 | 1544 | 224 | 0 | 0 | 97/234 | 14/34 |
| Neutral | 207/634 | 30/92 | 0 | 0 | 0 | 0 | 214/372 | 31/54 |
| Secondary | 1572/1634 | 228/237 | 0 | 0 | 1544 | 224 | 97/234 | 14/34 |
| **600** | | | | | | | | |
| Primary | 1413/1620 | 205/235 | 1379 | 200 | 0 | 0 | 14/55 | 2/8 |
| Neutral | 103/496 | 15/72 | 0 | 0 | 0 | 0 | 34/83 | 5/12 |
| Secondary | 1413/1620 | 205/235 | 0 | 0 | 1379 | 200 | 14/55 | 2/8 |

T-5202-01

**Oil Pressure Limits - 1725 kPa (250 psi) units** (235 psi minimum pressure when cruising)

| Input RPM & Shift Position | X Valve Inlet | | $Z_{PC}$ Primary Collector | | $Z_{SC}$ Secondary Collector | | G Lube | |
|---|---|---|---|---|---|---|---|---|
| | kPa min./max. | psi min./max. | Kpa min. | psi min. | Kpa min. | psi min. | kPa min./max. | psi min./max. |
| **1800** | | | | | | | | |
| Primary | 1725/1862 | 250/270 | 1696 | 246 | 0 | 0 | 97/234 | 14/34 |
| Neutral | 276/690 | 40/100 | 0 | 0 | 0 | 0 | 214/372 | 31/54 |
| Secondary | 1725/1862 | 250/270 | 0 | 0 | 1696 | 246 | 97/234 | 14/34 |
| **600** | | | | | | | | |
| Primary | 1586/1793 | 230/260 | 1558 | 226 | 0 | 0 | 14/55 | 2/8 |
| Neutral | 138/517 | 20/75 | 0 | 0 | 0 | 0 | 34/83 | 5/12 |
| Secondary | 1586/1793 | 230/260 | 0 | 0 | 1558 | 226 | 14/55 | 2/8 |

T-5202-02

| **Oil Pressure Limits - 2000 kPa (290 psi) units** (275 psi minimum pressure when cruising) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Input RPM & Shift Position | **X** Valve Inlet | | **$Z_{PC}$** Primary Collector | | **$Z_{SC}$** Secondary Collector | | **G** Lube | |
| | kPa min./max. | psi min./max. | Kpa min. | psi min. | Kpa min. | psi min. | kPa min./max. | psi min./max. |
| **1800** | | | | | | | | |
| Primary | 1960/2140 | 285/310 | 1960 | 285 | 0 | 0 | 100/380 | 15/55 |
| Neutral | 689/1034 | 100/150 | 0 | 0 | 0 | 0 | 280/450 | 40/65 |
| Secondary | 1960/2140 | 285/310 | 0 | 0 | 1960 | 285 | 100/380 | 15/55 |
| **600** | | | | | | | | |
| Primary | 1860/2000 | 270/290 | 1860 | 270 | 0 | 0 | 7/69 | 1/10 |
| Neutral | 255/310 | 37/45 | 0 | 0 | 0 | 0 | 20/140 | 3/20 |
| Secondary | 1860/2000 | 270/290 | 0 | 0 | 1860 | 270 | 7/69 | 1/10 |

***If the marine transmission is equipped with a hydraulic clutched PTO,*** oil pressure should be at these values at the PTO inlet:

| Input RPM | PTO Clutch Disengaged **$Z_1$** | | PTO Clutch Engaged **$Z_1$** | | Transmission |
|---|---|---|---|---|---|
| | kPa | psi | kPa | psi | |
| **600** | 0 | 0 | 1724-1862 | 250-270 | Primary or Secondary |
| **1800** | 0 | 0 | 1758-1896 | 255-275 | |
| **600** | 0 | 0 | 1655-1793 | 240-260 | Neutral |
| **1800** | 0 | 0 | 1689-1827 | 245-265 | |

T-5202-05

Note: Transmission control valve is the right valve and the PTO valve is the left valve when viewed from the rear of the transmission.

***For units with a hydraulic clutched PTO installed,*** cooling (lube) pressure may be less than the charted values by the following amount: 34kPa (5psi) less in primary, neutral or secondary at 1800 rpm; 14 kPa (2psi) less in primary, neutral or secondary at 600 rpm but not less than 10 kPa (1.5psi).

***For units with a trolling valve,*** with trolling lever at its “minimum” trolling pressure position (mechanical trolling valve) or maximum electrical current into trolling valve (electrical trolling valve), test pressures **$Z_{PC}$**, **$Z_{SC}$** and **G** or **X** must be at the values of the following chart for both input speed and shift specified:

| TROLLING OIL PRESSURE LIMITS | | | | | | |
|---|---|---|---|---|---|---|
| Input RPM & Shift Position | $Z_{PC}$ Primary Collector | | $Z_{SC}$ Secondary Collector | | G Lube | |
| | kPa min./max. | psi min./max. | kPa min./max. | psi min./max. | kPa min./max. | psi min./max. |
| **600 RPM** | | | | | | |
| Primary | 124/165 | 18/24 | 0 | 0 | 14/55 | 2/8 |
| Neutral | 0 | 0 | 0 | 0 | 34/83 | 5/12 |
| Secondary | 0 | 0 | 124/165 | 18/24 | 14/55 | 2/8 |

T-5202-04

For mechanical trolling valves, the clutch oil pressure with the lever at the maximum trolling pressure position (just before the detent and rate-of-rise event) must be at least 138 kPa (20psi) more than the values at the minimum trolling pressure position.

## H. Oil Viscosity

**NOTE**: Steady operation below 66ºC (150ºF) or above 93ºC (200ºF) is not recommended.

| Oil Recommendation Based on Oil Temperature at Heat Exchanger Inlet | | |
|---|---|---|
| During Start-up | Steady Operating Conditions | Recommended Oil Viscosity |
| | Below 66°C (150°F) | This operating condition is not recommended |
| 2°C (35°F) Minimum | 66-93°C (150-185°F) | SAE 40 |
| 10°C (50°F) Minimum | 80-93°C (175-200°F) | SAE 50 |
| | Above 93°C (200°F) | This operating condition is not recommended |

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## I. Minimum Clutch Plate Thickness

Minimum recommended clutch friction plate thickness is 2.90mm (0.114 inch). Minimum recommended clutch steel plate thickness is 2.29mm (0.090 inch).

## J. Heat Exchanger Requirements

PERMISSIBLE OIL TEMPERATURE INTO HEAT EXCHANGER

| Ratio | Oil Viscosity | Max. | Min. |
|---|---|---|---|
| All | SAE 40 | 85 °C (185°F) | 65 °C (150°F) |
| All | SAE 50 | 93 °C (200°F) | 80 °C (175°F) |

| **MIN. HEAT TRANSFER CAPACITY** | **KW (BTU/MIN) PER ENGINE RTD. H.P.** |
|---|---|
| Apply appropriate service factor for fresh and raw water. | Continuous Duty: .026 (1.484)<br>P.C. & Int. Duty: .022 (1.272) |

**Approx. Oil Flow to H.E.:** 3.82 L/Min (1.01 gpm) per 100 Engine rpm
**Peak Oil Pressure at H.E.:** (Proof Test H.E. at 1.5 X kPa (psi): 2840 kPa (412 psi)
**Max. Oil Pressure Drop Across H.E. with 66mm²/sec (300) SUS Oil at Rated Engine rpm:** 207 kPa (30 psi)
**Water Flow to H.E.:** Use 1.5 to 3.0 Times Oil - L/Min. gpm)
**H.E. Water Pressure Rating Min.:** 1.5 X H.E. Inlet Water kPa (psi)

**DATA H.E. PURCHASER MUST ALSO TELL VENDOR**
State if raw (open channel & sea) or fresh (closed keel cooler) water will cool H.E.
State max. water temp. into H.E. - Typical - Raw water - 29°C (85°F). Keel cooler water - 60°C (140°F)
State min., also max. L/Min. (gpm) of water flow to H.E.

**HEAT EXCHANGER INSTALLATION & SERVICE REQUIREMENTS**
Oil Lines, Transmission to H.E. and Return -
(1) **Max Velocity in Fittings, Pipe, Hose and Tubes:** 7.6 m/sec (25 ft/sec)
(2) **Burst Pressure Min.:** 10 X Peak Oil Pressure at H.E.
(3) **Hose:** SAE J517 100R1 Meeting USCG 46CFR 56.60-25 (C).135°C (275°F)Temperature Rating.
(4) Protect lines from mechanical damage. Zinc anodes protect H.E. raw water passages from corrosion. Check & replace them frequently.

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## 4.2 In-boat Maintenance

Certain transmission maintenance/repair procedures can be accomplished in the boat provided sufficient space exists to work. These procedures are:

- Removing and installing the oil pump.
- Changing the filter.
- Removing, cleaning and installing the suction strainer.
- Removing and installing the control valve.
- Removing and installing the manifold or top cover, bearing carrier and lube tube.
- Removing and installing the primary and secondary shaft assemblies.
  ***NOTE: See special tools section for lifting bracket to aid in clutch removal.***
- Changing primary and secondary clutch plates.
  ***NOTE: Further disassembly/reassembly of the primary or secondary shafts will require use of tools and equipment normally not available on board the vessel.***

## 4.3 General Maintenance

### A. Lubrication

Grease the oil seals on the output end of the output shaft through the grease fitting with water pump (lithium soap-based NLGI No. 2) grease. Apply grease every 100 hours or when the boat is docked.

No other lubrication is required beyond the daily oil check.

### B. Oil System

***Oil Level***

The oil level should be checked daily or every 10 hours. Check oil level before starting the engine to confirm that the transmission has oil in it. With the engine running at low idle and the transmission in Neutral, check the oil again. The oil level should be near the “low” oil level mark. Transmission oil temperature should be in the normal operating range prior to finalizing the oil level between the low and full marks on the oil level gauge.

***Oil and Filter Change Interval***

With a new transmission, change the oil and filter element within the first 50 hours of operation. Change oil and filter element after each 1000 hours thereafter or more often if conditions warrant.

For a rebuilt transmission, check the filter element after eight hours of operation. If the filter is clean, install a new filter element and then change the oil and filter element after 1000 hours of service. If the filter is dirty, change the element and operate for another eight hours. Check the filter again. Continue this cycle until the filter is clean and then change the oil and filter after 1000 hours of service or more often if conditions warrant.

***Draining***

Drain the transmission by removing the O-ring plug at the rear side at the bottom.

***Oil Suction Strainer***

Remove and clean the pump suction strainer at every oil change or sooner if necessary. See Section 13.4 for suction strainer location.

***Type Oil Recommended***

See Section 4.1, Specifications & Maintenance.

***Filling***

1. Remove the filler breather in the top cover of the transmission.
2. Fill the transmission's sump with 26.5 liters (7.0 U.S. gal.) for shallow case models or 31.4 liters (8.3 U.S. gallons) for deep case models of the proper weight and type oil. See preceding specifications for oil recommendations.
3. Start the engine and let it idle with transmission in neutral until oil is circulated throughout the hydraulic system. Add oil if necessary to bring the oil level up to the "low" mark with the engine at low idle.
4. With the oil at operating temperature, transmission in neutral, and the engine running at low idle, check the oil level with the oil gauge. Add or remove oil if necessary to bring the oil level to "FULL" mark on the oil gauge.
5. Allow the oil temperature to cool to normal cold oil conditions (perhaps overnight). Check the oil level while cold at low idle engine speed while in neutral. Make note of the oil level in the cold conditions for future reference, as it corresponds to the correct oil level at operating temperature.

## C. Torsional Coupling

Do not obstruct the flywheel housing vents preventing the free flow of air for cooling the coupling. The ambient temperature of the air around the coupling should be between -6$^{O}$C (22$^{O}$F) and 80$^{O}$C (176$^{O}$F). Assure baffles are installed properly so hot air is ported out of the housing.

Visually inspect the element after the first 100 hours of operation and every 2000 hours thereafter, or every six months, whichever comes first. Torsional vibration, misalignment, degradation by contaminants (oil), heat, ultraviolet radiation, and excessive system torque

can cause cracks or other signs of distress to appear on the surface of the rubber. The above-described items affect the life of the coupling element.

When inspecting the flexible coupling, follow the steps:

1. Look for:

   A. Cracks in the surface of the rubber. May be caused by torsional vibrations, excessive misalignment or exposure to contaminants (heat, petroleum products, chemicals, ozone, ultraviolet radiation, etc.) excessive system torques.

   B. Separation of rubber from flex plate on coupling plate or deterioration of the rubber-to-metal bond. See A above.

   C. Deterioration of the rubber element, as evidenced by sponginess or by black carbon-like dust on rubber surface. May be caused by contaminants or excessive heat, either external or internal to the coupling.

   D. Cracked, bent or otherwise damaged flex plate or coupling plate.

   E. Bolt holes in flex plate or coupling plate elongated oval shaped, not round. This could be caused by improperly assembled parts, loose parts, vibration or improperly torqued parts.

      If defects are found, replace defective parts.

   F. Bolts/nuts—bent, worn or stripped threads.

      Replace defective fasteners.

2. Inspect hub. Look for:

   A. Damaged or worn splines.

   B. Cracked parts.

   C. Oil seal surface for wear or damage.

      Replace defective parts.

### D. Heat Exchanger Check

Heat exchangers furnished by Twin Disc to be used for salt water applications have zinc rods installed at the inlet and outlet heads. These rods must be checked every 90 days. If over 50% of the rod is disintegrated, it should be replaced to provide effective protection.

Excessive corrosion of the zinc rod indicates electrolytic action. A careful inspection should be made to determine if this action is caused by a short circuit or external grounded electric current. If these conditions do not exist, it is evident that the corrosion is due to local electrolysis. If rods are corroded with foreign materials, they should be cleaned with a wire brush.

## E. Overhaul Interval

A complete overhaul of the unit should be made at the same time that the engine is overhauled.

***Periodic Visual Inspection.***

1. Check the mountings for tightness or damage such as cracks. Tighten loose mountings and replace damaged parts.
2. Check pressure and temperature gauge where applicable.
3. Inspect the oil lines and heat exchanger for leaky connections, cracks, or other damage. Replace damaged lines.
4. Periodically, inspect the drive line and the input and output shaft oil seals for leakage. Replace parts as required.

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Section 5

# Troubleshooting

## 5.1 Troubleshooting Chart

The following chart is intended as a guide for determining the cause of problems that could be encountered and the corrective actions for those difficulties.

The transmission is one part of a complete power package. Problems in the input power system or the output power delivery components can cause problems to develop in the transmission. It is therefore important that the entire power package be considered when problems are encountered.

Tables begin on the next page.

| Symptom | Cause | Remedy |
|---|---|---|
| 1. Low main oil pressure | 1-1 Partially clogged oil strainer. | 1-1 Remove and clean oil strainer. |
| | 1-2 Stuck pressure regulator piston or shuttle spool. | 1-2 Disassemble valve and clean piston & spools. |
| | 1-3 Broken piston rings on clutch shaft(s). | 1-3 Remove the collector and inspect piston rings. Replace broken piston rings. |
| | 1-4 Damaged or worn oil pump assembly. | 1-4 Replace damaged or worn oil pump assembly (pump is not serviceable). |
| | 1-5 Damaged wiring to control valve. | 1-5 Replace damaged or worn wiring. |
| | 1-6 Clogged or plugged orifice in orifice plate of control valve assembly. | 1-6 Remove orifice plate cover. Clean parts. |
| | 1-7 Shimming required between regulator springs and rate-of-rise piston. | 1-7 Shim as required. |
| | 1-8 Engine idle speed too low. | 1-8 Raise engine speed. |
| 2. No oil pressure, or erratic low pressure at control valve tap. | 2-1 Oil pump suction strainer plugged. | 2-1 Remove and clean strainer. |
| | 2-2 Oil level low. | 2-2 Check oil level and correct. |
| | 2-3 Air leak on suction side of pump. | 2-3 Correct cause of air leak. |
| | 2-4 Pump drive on reverse clutch shaft broken. | 2-4 Disassemble and repair as required. |
| | 2-5 Regulating valve stuck in open position. | 2-5 Remove, disassemble, clean and repair the regulating valve. |
| | 2-6 Oil pump defective. | 2-6 Replace oil pump. |
| | 2-7 Leaking heat exchanger has caused oil to be lost overboard. | 2-7 Replace heat exchanger. |

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| Symptom | Cause | Remedy |
|---|---|---|
| 3. High main oil pressure. | 3-1 Regulating valve stuck. | 3-1 Remove and clean regulating valve. |
| | 3-2 Improperly shimmed. | 3-2 Shim as required |
| | 3-3 Lube relief valve malfunction. | 3-3 Inspect, repair or replace parts as necessary. |
| 4. High temperature | 4-1 Improper oil level (high or low). | 4-1 Check and fill (or drain) with proper oil to correct level. |
| | 4-2 Faulty heat exchanger. | 4-2 Inspect, repair or replace heat exchanger. |
| | 4-3 Clutches slipping. | 4-3 Check clutch apply oil pressure. If pressure is normal, remove, disassemble and repair slipping clutch. |
| | 4-4 Bearing failure. | 4-4 Overhaul marine transmission. |
| | 4-5 Air leak on suction side of pump. | 4-5 Inspect and correct cause of suction leak. |
| | 4-6 Control valve malfunction. | 4-6 Inspect, repair, or replace control valve. |
| 5. Excessive noise. | 5-1 Bearing failure. | 5-1 Overhaul marine transmission. |
| | 5-2 Worn or damaged input coupling. | 5-2 Remove marine transmission. Replace worn or damaged coupling. |
| | 5-3 Excessive torsional vibration. | 5-3 Select proper torsional coupling. |
| | 5-4 Worn or damaged gears. | 5-4 Overhaul transmission. |
| | 5-5 Improper alignment. | 5-5 Check alignment of engine and transmission output flange to propeller shaft correct as necessary. |
| | 5-6 Damaged propeller. | 5-6 Repair propeller. |
| | 5-7 Misfiring engine. | 5-7 Repair engine. |

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| Symptom | | Cause | | Remedy | |
|---|---|---|---|---|---|
| 6. | No neutral. | 6-1 | Clutch plate warped. | 6-1 | Remove clutch plate. Overhaul unit. |
| | | 6-2 | Stuck shuttle spool. | 6-2 | Disassemble valve and clean spools. |
| | | 6-3 | Solenoid malfunction (units equipped with electric selector valve). | 6-3 | Replace defective solenoid. |
| | | 6-4 | Hydraulic lock piston stuck (unit equipped with electric selector valve and hydraulic lock). | 6-4 | Inspect, repair or replace hydraulic lock spool. |
| 7. | Harsh engagement. | 7-1 | Regulating piston or rate-of-rise piston stuck. | 7-1 | Disassemble control valve. Clean parts. Replace parts if necessary. |
| | | 7-2 | Orifice plate ball in control valve not seating properly. | 7-2 | Remove orifice plate cover. Clean parts. Replace parts if necessary. |
| | | 7-3 | Blown gasket on either side of orifice plate. | 7-3 | Replace gasket. |
| 8. | Low lube pressure. | 8-1 | Pump flow output too low. | 8-1 | Replace pump. |
| | | 8-2 | Pump suction strainer plugged. | 8-2 | Remove, clean, inspect and install the suction screen. |
| | | 8-3 | Lube relief valve malfunction. | 8-3 | Remove and clean or replace parts as necessary. |
| | | 8-4 | Broken piston ring. | 8-4 | Replace damaged piston rings. |
| 9. | Oil spilling out of breather. | 9-1 | Oil level too high. | 9-1 | Adjust oil level. |
| | | 9-2 | Wrong type of oil. | 9-2 | Draw and refill with recommended oil. |

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Section 6

# Disassembly

## 6.1 Prepare Transmission for Disassembly

**Note:**
The following procedure is for complete disassembly of the unit. Prior to this procedure, the transmission should be removed from the boat. The work should be done in a fully equipped facility by qualified personnel.

During service of this unit, all O-rings, gaskets and seals must be replaced. It is good practice to keep the old O-rings, gaskets and seals with the appropriate components being disassembled for future reference during the assembly process (to make sure you don't forget the quantity, size, etc.).

*NOTE: The MG-5202SC (except drawing numbers 1014841 and 1015389), MG5203SC, MG5204SC, and MG5202DC require the use of an SKF THAP 300 Oil Injection Kit (see Section 11, Special Tools) or similar device to remove the output shaft.*

*NOTE: The illustrations used in this manual are for the MG5202SC transmission. MG5203SC, MG5204SC, and MG5202DC transmissions are similar.*

Remove drain plug and drain the oil from transmission.

## 6.2 Remove External Components

a. Remove filter drain plug and drain filter. Remove filter (fig. 6-1).

Fig. 6-1

b. Remove control valve and gasket.

c. Remove torsional coupling from spline on primary shaft (if not previously removed).

d. Remove front housing from main housing.

e. Remove top cover and gasket.

f. Remove oil pump.

g. Remove hex-head capscrew securing clamp plate for suction strainer cover. Remove clamp plate, suction strainer cover with O-ring and suction strainer.

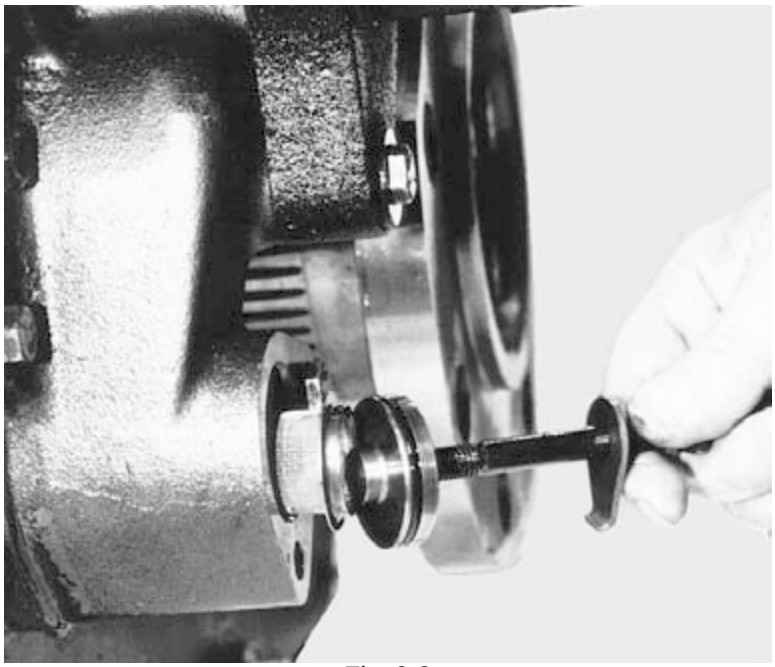

Fig. 6-2

## 6.3 Remove Output Flange

1. Turn transmission and lay on wood blocking with output side up. Be sure that transmission is supported securely and that primary shaft is clear of floor.
2. Remove hex-head capscrews securing output flange to output shaft. Remove retaining washer, shims and O-ring seal.

Fig. 6-3

**If your output shaft is splined, follow this instruction:**

3a. Use hydraulic jack to pull output flange from output shaft.

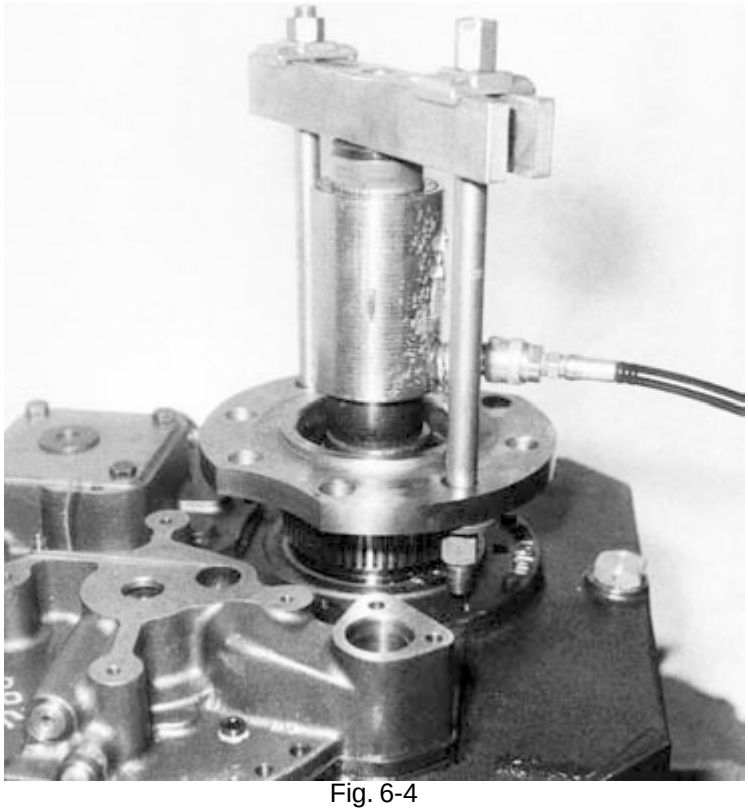

Fig. 6-4

**If your output shaft is tapered, follow these instructions:**

3b. Connect oil injector to output flange hub.

3c. Install two eyebolts with nuts into the holes of the output flange. Install one eyebolt into each of the side mounting pads of the transmission housing.

3d. Install a safety strap through the eyebolts in the output flange and attach the strap's ends to the eyebolts in the housing.

**⚠ WARNING**

**The parts separate with EXTREME force, potentially causing great physical harm. Use EXTRA CAUTION and proper safety procedures.**

3e. Inject oil with a viscosity of 900 $mm^2/S$ (900 cSt) at room temperature (dismounting fluid) into the output flange hub until it separates from the output shaft taper.

## 6.4 Remove and Disassemble Manifold and Bearing Carrier

1. Remove capscrews securing manifold and bearing carrier to housing.
2. Use two of the removed screws as pusher screws to separate manifold from bearing carrier and dowel pins. Remove manifold and gasket. Remove the manifold bushings and O-rings (used on some models - check unit Bill of Material for usage) .
3. Remove bearing retainers and shims from bearing bores in bearing carrier for primary and secondary shafts.
4. Remove internal retaining ring and filter bypass valve
5. Remove lubrication tube from bearing carrier.
6. Use two of the removed screws as pusher screws again to separate bearing carrier from housing. Remove bearing carrier and gasket.
7. Remove tapered roller bearing cups from bearing carrier for rear bearings for primary and secondary shafts.
8. Remove lube relief valve housing, relief valve spring and steel ball.

## 6.5 Remove Primary and Secondary Shafts.

1. Lift out primary and secondary shafts.

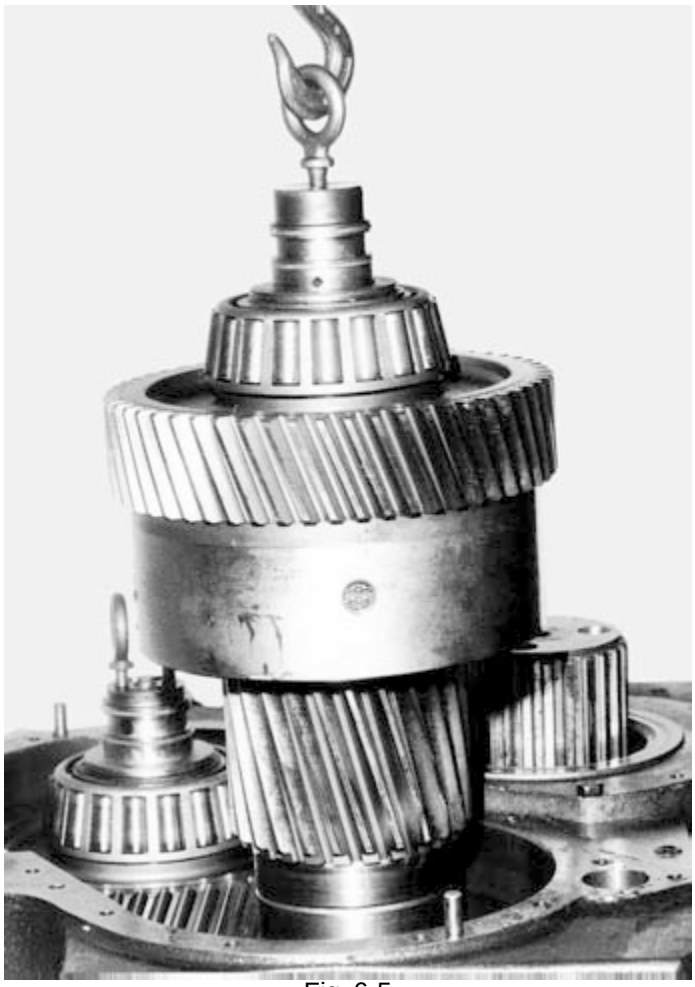

Fig. 6-5

*NOTE: Tapered roller bearing cups of front bearings on the primary and secondary shafts are an interference fit in the housing. Removal of these bearing cups should not be attempted unless replacement of the bearing is necessary.*

2. Remove front pinion tapered roller bearing cones and spacer (shallow case units only) that were pulled off by output gear as primary and secondary shafts were removed.

*NOTE: Spacer (used on 3.48:1 ratio transmissions only) will be pulled off with tapered roller bearing cones.*

3. Remove oil gauge and oil gauge tube assembly.

4. Position transmission upright. Support securely.

## 6.6 Remove Output Shaft and Gear

**If your unit is a MG5202SC assembly 1014841 or 1015389, follow these instructions:**

1. Remove four gear pan attaching screws and sealing washers. Remove gear pan from transmission housing.
2. Lay transmission on blocks with the output side up. Leave at least 50mm (2 inches) clearance between housing and floor.
3. Remove output shaft seal carrier.

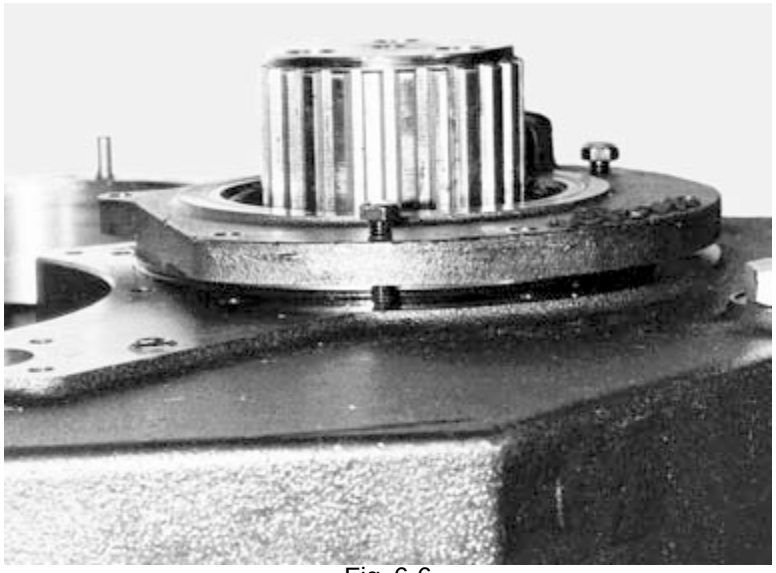

Fig. 6-6

Remove O-ring and oil seals from seal carrier.

4. Remove shims from output bearing bore of housing.

5. Use a hoist to lift output shaft and gear assembly until gear contacts housing. Place blocks under gear to support it in a position where a bearing puller can be used to remove the tapered roller bearing cone from the output shaft (see fig. 6-7). Remove the bearing cup from above the bearing cone. Remove the bearing cone from the output shaft by pulling on the cone and pushing on the output shaft. Retain the blocking to temporarily hold the gear and shaft assembly in position.

Fig. 6-7

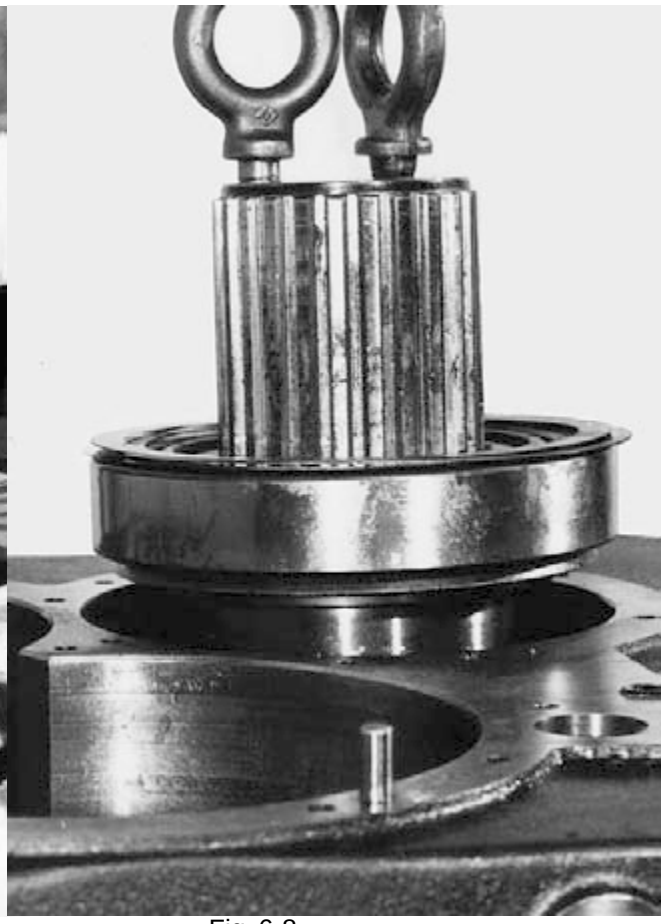

Fig. 6-8

6. Install a round metal spacer 114 mm dia. (4.5 in.) x 25mm (1.0 in.) thick at front end of output shaft inside cup plug.

7. Support weight of output shaft and gear assembly and remove blocks installed in step 5. Lower shaft and gear assembly until weight is supported by spacer and cup plug. Remove hoist. Using a soft hammer, drive the gear and shaft assembly downward to remove cup plug. Shaft and gear assembly will be supported by front tapered roller bearing when cup plug and spacer are driven out of housing bore.

8. Block gear and shaft assembly against other side of housing to premit transmission housing to be turned over.

9. Turn housing so that the input side is up. Remove external retaining ring from output shaft. Move housing to 200 ton press.

10. Install sleeve over output shaft end to butt against rear side of output gear. (Sleeve dimensions are: 33mm (5.25 in.) I.D. x 356 mm (14 in.) long with a wall thickness of 13mm (1/2 in.) to 19 mm (3/4 in.))

11. Remove internal blocking that was holding gear and shaft in position.

12. Place heavy wood block 51 mm (2 in.) to 76 mm (3 in.) thick under sleeve and output shaft. Locate transmission housing sleeve and block directly under press so cup plug hole is under ram. Lower housing far enough so that sleeve raises gear and shaft assembly until front bearing cone on output shaft is aligned with the bearing cup in housing.

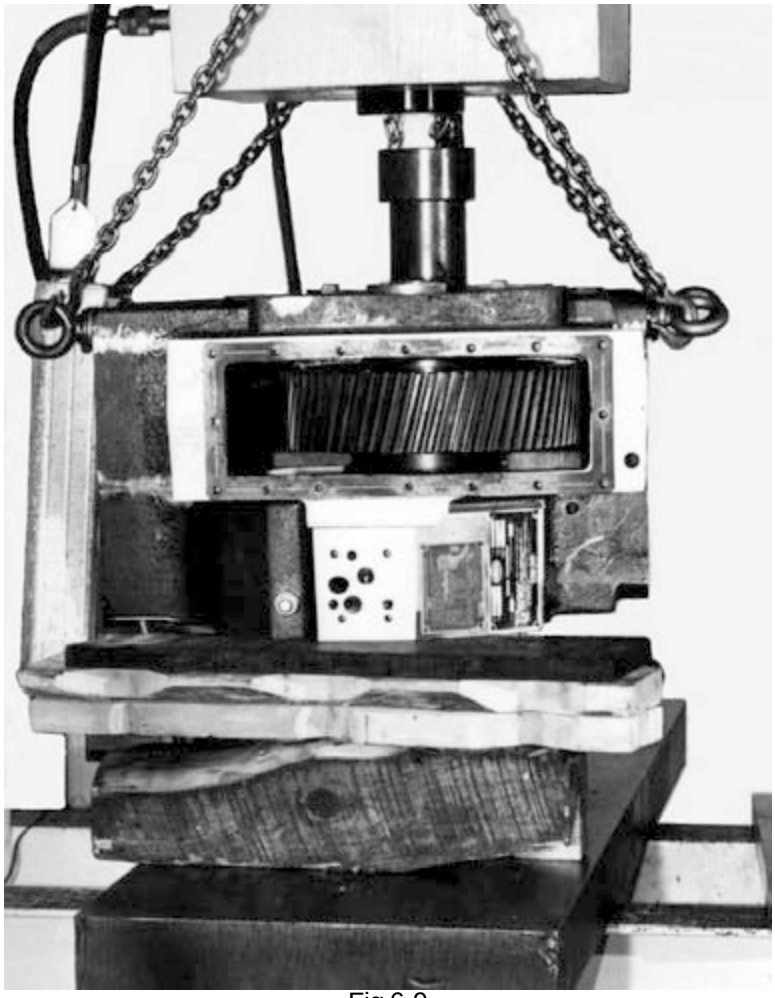

Fig 6-9

13. Block or hold housingso that press orce can be exerted squarely against front end of output shaft (see fig. 6-9). Apply 1334 kN (150 tons) to 1557 kN (175 tons) of force to press shaft out of output gear and to press front output bearing cone off output shaft.

14. Lift housing off of press and raise high enough so that sleeve and output shaft can be removed.

15. Remove output gear and front output bearing cone through top cover opening in housing.

16. Tapered roller bearing cups for front bearings on primary pinion, secondary pinion, and output shaft are an interference fit in their respective bearing bores. Remove these bearing cups only if replacement is required. To remove these bearing cups, weld a light bead around the I.D. of the bearing cup with an electric welder. This will shrink the cup and facilitate removal. Bearings removed in this manner must be replaced.

**If your unit is a MG5202SC assembly 1016103, a MG5202DC, a MG5203SC, or a MG5204SC, follow these instructions:**

1. Remove four gear pan attaching screws and sealing washers. Remove gear pan from transmission housing.

2. Lay transmission on blocks with the output side up. Leave at least 50mm (2 inches) clearance between housing and floor.

3. Remove output shaft seal carrier.

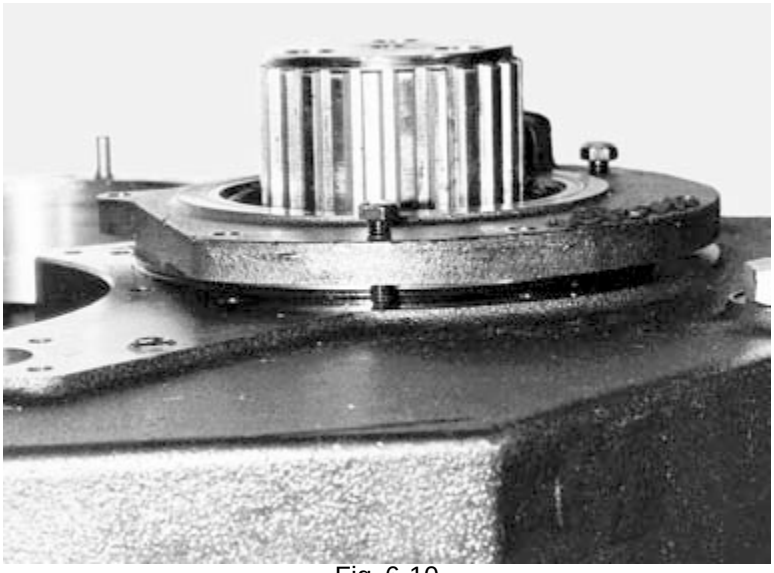

Fig. 6-10

Remove O-ring and oil seals from seal carrier.

4. Remove shims from output bearing bore of housing. (Shims on a MG5202DC are located between the output seal carrier and the housing).

5. Use a hoist to lift output shaft and gear assembly until gear contacts housing. Place blocks under gear to support it in a position where a bearing puller can be used to remove the tapered roller bearing cone from the output shaft (see fig. 6-

12). Remove the bearing cup from above the bearing cone. Remove the bearing cone from the output shaft by pulling on the cone and pushing on the output shaft. Retain the blocking to temporarily hold the gear and shaft assembly in position.

Fig 6-11

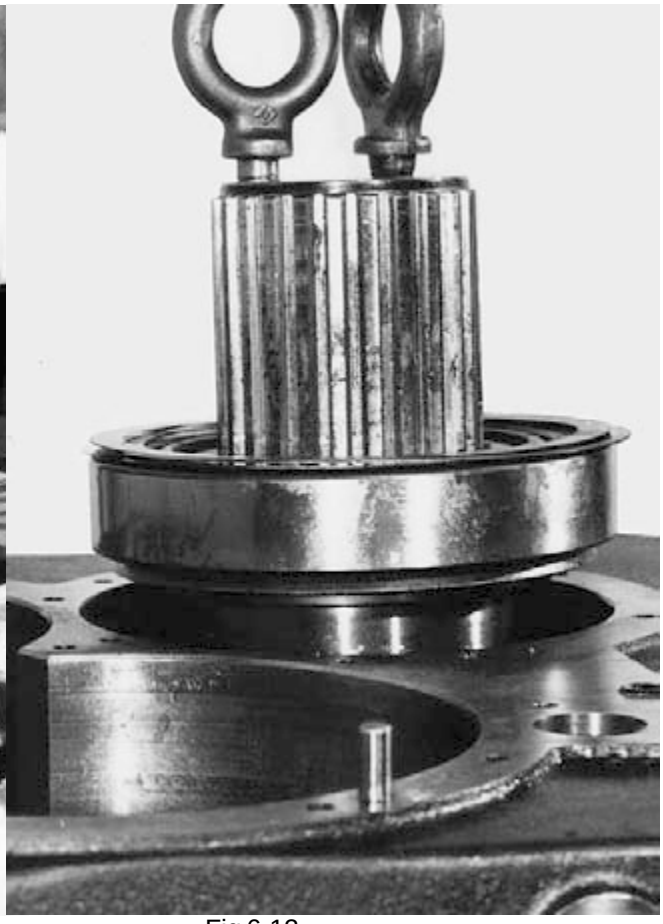

Fig 6-12

6. Connect oil injection equipment to the output shaft.

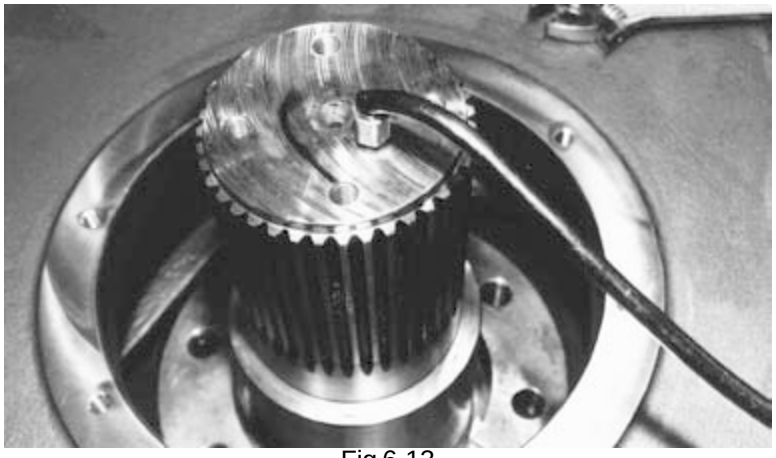

Fig 6-13

7. Install eyebolts into the end of the output shaft and into the main housing mounting pads.

8. Thread a heavy strap through the eyebolts in the output shaft and the strap to the eyebolts in the main housing. The strap will restrain the output shaft during disassembly.

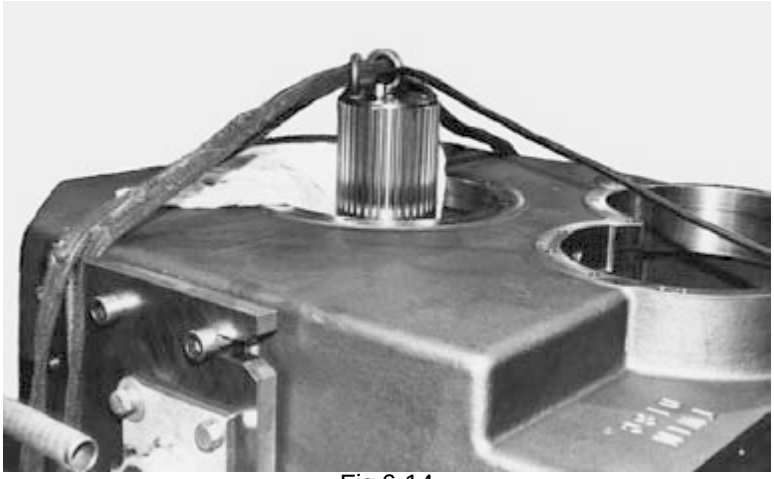

Fig 6-14

**⚠ WARNING**

**The parts separate with EXTREME force, potentially causing great physical harm. Use EXTRA CAUTION and proper safety procedures.**

9. Inject oil with a viscosity of 900 $mm^2/S$ (900 cSt) at room temperature (dismounting fluid) into the output shaft until the shaft and gear separate. Remove the output shaft, gear, and front output bearing cone.

10. Tapered roller bearing cups for front bearings on primary pinion, secondary pinion, and output shaft are an interference fit in their respective bearing bores. Remove these bearing cups only if replacement is required. To remove these bearing cups, weld a light bead around the I.D. of the bearing cup with an electric welder. This will shrink the cup and facilitate removal. Bearings removed in this manner must be replaced.

## 6.7 Disassembly of Primary Shaft or Secondary Shaft (Disassembly of Secondary Shaft is Described)

1. Remove two piston rings from rear end of shaft.

2. If rear bearing must be removed, remove bearing retaining ring from rear end of shaft. Remove the bearing as follows:

*NOTE: Do not remove rear bearing unless bearing must be replaced. Bearing is an interference fit with shaft and will be destroyed during removal.*

a. With a hammer and chisel, cut cage off bearing to remove bearing cage and rollers.

b. Use a split-type bearing puller (cheese cutter) to grip flange at small end of tapered inner race.

c. With a hydraulic jack, pull on bearing inner race while pushing on rear end of shaft to remove bearing inner race from shaft.

3. Set shaft upright with input end up.

4. Remove and disassemble pinion(s).

a. Remove round retaining ring from input end of shaft and remove pinion from shaft.

b. Remove internal retaining ring from input end of pinion and remove straight roller bearing.

Fig. 6-15

c. Remove tapered roller bearing outer race from bore at rear of pinion if bearing requires replacement. This bearing race is an interference fit in the pinion bore. To remove, use an electric welder to weld a light bead around the I.D. of the bearing race. This will shrink the bearing cup to facilitate removal. Bearings removed with this method must be replaced.

5. Remove tapered roller bearing inner race from shaft. (Bearing supports rear of pinion.) This bearing is a slip fit and should remove easily.

6. Remove internal snap ring at front of clutch housing and remove clutch backing plate.

7. Remove clutch plates (10 steel, 11 friction).

8. Remove clutch apply piston.

a. Place clutch in a press, input side up. Use special tool #T19998 to compress clutch release springs and expose round retaining ring.

Fig. 6-16

b. Remove retaining ring. Slowly release pressure on press and remove shaft from press. Remove special tool #19998 and spring retainer. Remove clutch release springs form pockets in face of piston.

c. Apply compressed air to hydraulic pressure port to force piston from piston bore. Remove clutch apply piston.

Fig. 6-17

d. Remove piston ring from ring groove in shaft (seals I.D. of clutch piston) and piston ring from ring groove in O.D. of clutch piston.

*NOTE: Do not separate clutch housing/transfer gear from the secondary shaft unless the shaft or the clutch housing must be replaced and the mating part remains serviceable. Use the following procedure to separate the housing/transfer gear from the primary or secondary shaft :*

9. To remove clutch housing, place shaft and clutch housing on a press, front end of shaft down. Place a sleeve over input front end of shaft with an I.D. only slightly larger than the O.D. of the shaft taper large end [95.25mm (3.75 in.)]. Rest one end of sleeve on a heavy wood block while the other end supports the inner face of the clutch housing. Apply press force to rear end of shaft to separate shaft from clutch housing. Restrain parts to prevent damage as thetapered joint separates.

Section 7

# Cleaning and Inspection

## 7.1 Cleaning

**NOTE:** Replace all oil seals, gaskets, O-rings, piston rings, seal rings, snap rings, etc., as a part of any maintenance or overhaul procedure. Replace shims that are damaged or destroyed in disassembly.

1. Clean all parts using EPA/OSHA approved solvents or by steam cleaning. Parts must be dried and oiled immediately.
2. Examine all parts carefully for grit, dirt and abrasives and reclean them if necessary.
3. Clean all oil passages by working a piece of wire back and forth through the passages and then flushing them with cleaning solvent.
4. Use clean solvent to flush oil pumps, valves, etc.
5. Flush all hoses, tubing, coolers etc., particularly if the unit is being disassembled because of an internal failure.
6. De-burr the housing and bearing carrier with a stone or file in the vicinity of all pusher screw locations.

### A. Cleaning Bearings

Do not remove grease in which new bearings are packed. Thoroughly wash bearings that have been in service. Soak bearings in solvent if they are particularly dirty or filled with hardened grease.

**⚠ CAUTION**

**Never dry bearings with compressed air. Do not spin unlubricated bearings. Oil bearings with SAE 10 engine oil immediately after cleaning. Oil bearings before inspection.**

### B. Preventing Dirt from Entering into Bearings

Dirt and grit in bearings are often responsible for bearing failure; consequently, it is important to keep bearings clean. Do not remove grease from new bearings. Keep the wrapper on new bearings until they are installed. Do not expose clean bearings if they are not to be assembled at once. Wrap them with a clean lint-free cloth or paper to keep out dust.

### C. Previously Sealed Joints

1. For previously sealed joints, remove all old gasket material or silicone.
2. Clean surfaces with solvent to remove oil and grease residue.
3. Test for clean surfaces by applying a few drops of cool water to the surfaces. Parts are sufficiently clean if water covers the surface in a film. If the water puddles or forms beads, use fresh solvent and reclean.

## 7.2 Inspection

### A. Housings, Cast Parts, and Machined Surfaces

1. Replace cast parts or housings that are cracked.
2. Inspect bores for wear, grooves, scratches and dirt. Remove burrs and scratches with crocus cloth or soft stone. Replace deeply grooved or scratched parts. Do not remove excess material by sanding. This will cause loss of press of bearings or races.
3. Inspect oil passages for obstructions. If you find an obstruction, remove it with compressed air or work a wire back and forth through the passage and flush it with solvent.
4. Inspect machined surfaces for burrs, scratches, nicks and foreign matter. Be sure to inspect the housing in the vicinity of all pusher screw locations. If you cannot remove defects with crocus cloth or a soft stone, replace the part.
5. Inspect threaded openings for damaged threads. Chase damaged threads with a tap of the correct size.
6. Inspect studs for damaged threads and looseness. Replace defective studs.
7. Inspect dowel pins for wear or damage. Replace defective dowels. This applies where a matched set of parts is not involved.
8. Inspect dowel pin holes for wear due to movement between mating parts. If a dowel pin hole is worn, re-bore and sleeve the hole when possible. Otherwise, replace the parts. This applies where a matched set of parts is not involved.

### B. Check-Ball Seats

Inspect check-ball seats for burrs, nicks and scratches. If you cannot remove these defects with a crocus cloth, replace the part. Check to see that the check-ball is seating properly after reworking the check-ball seat.

### C. Bearings

1. Inspect bearings for roughness of rotation. Replace the bearing if the rotation is rough.
2. Inspect bearings for corrosion, and for indication of wear of balls or rollers. Inspect for scored, scratched, cracked, pitted or chipped races. If you find one of these defects, replace the bearing.
3. Inspect bearing bores and shafts for grooved, burred, or galled conditions that would indicate the bearing has been turning in its housing or on its shaft. If you cannot repair the damage with crocus cloth, replace the part.

### D. Bushings and Sleeves

Inspect bushings for size and out-of-roundness. Inspect for scores, burrs, sharp edges, and evidence of overheating. Remove scores with crocus cloth. If the bushing is out-of-round, deeply scored, or excessively worn, replace it.

### E. Thrust Washers and Spacers

Inspect thrust washers for distortion, scores, burrs and wear. Rework or replace any defective thrust washers or spacers.

### F. Gears

1. Inspect gears for scuffed, nicked, burred or broken teeth. If you cannot remove the defect with a soft stone, replace the gear.
2. Inspect gear teeth for wear that may have destroyed the original tooth shape. If you find this condition, replace the gear.
3. Inspect thrust faces of gears for scores, scratches and burrs. If you cannot remove these defects with a soft stone, replace the gear.

### G. Splined Parts

Inspect splined parts for stripped, twisted, chipped or burred splines. Remove burrs with a soft stone. Replace the part if other defects are found.

### H. Springs

Inspect springs for broken or distorted coils. Replace the spring if either of these defects is found.

### I. Clutch Plates

Inspect clutch plates for signs of overheating, pitting, or excessive wear of the friction and splined surfaces. Replace the clutch plates if one of these defects is found. Refer to specifications listed in Section 4.

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Section 8

# Subassemblies

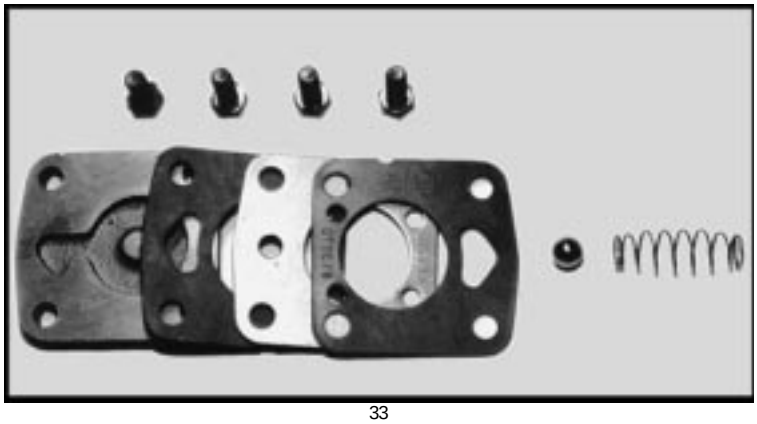
## 8.1 Mechanical Control Valve

### A. Disassembly

**⚠ CAUTION**

**Steel ball is under pressure from the spring. Care must be taken when removing the cover and orifice plate to prevent loss of steel ball.**

1. Remove the orifice plate cover, orifice plate, gaskets, check ball and spring.



33

2. Remove the rate-of-rise piston, pressure regulating springs, and pressure regulator piston. The pressure regulator adjustment shims are in the spring pocket of the rate-of-rise piston.
3. Remove the O-ring plug, O-ring, detent spring(s), and detent.
4. Mark the lever and the stem to indicate the position the lever was installed on the stem. Loosen the screw clamping the shift lever to the stem and remove the lever. It may be necessary to splay the lever to be able to remove it. **DO NOT** apply any impact force to the lever, as the stem, lever, or bearing might get damaged.

5. Mark the stop and the stem to indicate the position the stop was installed on the stem. Drive the rollpin out of the stop with a drift punch, and remove the stop.

36

6. Remove the valve cover and valve stem.
7. Slide the valve stem out of the valve cover.
8. Remove the gasket , O-ring and oil seal from the valve cover.
9. Remove the thrust bearing and races from the valve stem.

## B. Cleaning and Inspection

See Section 7.

## C. Assembly

1. Install the thrust bearing and races onto the valve stem.
2. Install a new oil seal and O-ring into the valve cover. Coat the seal lip, O-ring, and stem with light assembly grease.
3. Install the valve stem into the valve cover. Use caution to prevent damage to the oil seal, O-ring, and bearing.
4. Install the cover gasket and valve stem and cover assembly onto the valve body.
5. Install the cover capscrews. Torque to specification (see Torque Chart).
6. Install the stop and rollpin, lining up the marks made at disassembly. Use small punch to line up the rollpin hole in the stop with the corresponding hole in the stem. Continue to hold the holes in alignment as the rollpin is driven into place. Support the stop while driving in the roll pin to prevent damage to the stem and valve.
7. Install the shift lever onto the stem, lining up the marks made at disassembly. Torque the screw to specification (see Torque Chart).
8. Install the pressure regulator piston, regulating springs, shims and rate-of-rise piston into the bore in the valve body.

9. Install the spring and check ball, orifice plate gasket. Install the orifice plate with the chamfered side of the hole (check ball seat) toward the check ball. Install the cover gasket, cover, and attaching screws. Torque the screws to specification (see Torque Chart).

## 8.2 1017390 or 1018084 Electric Control Valve

Remove valve from transmission and separate the valve body halves.

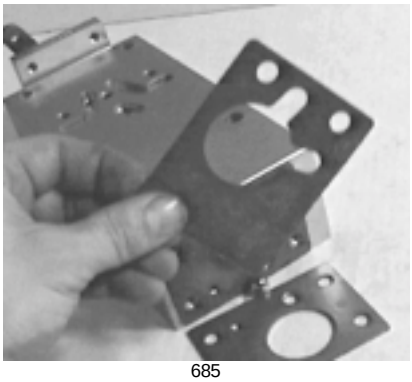
Remove the gasket from the valve body half.

### A. Disassembly of lower valve body half (manual section).

**⚠ CAUTION**

**Steel ball is under pressure from the spring. Care must be taken when removing the cover and orifice plate to prevent loss of steel ball.**

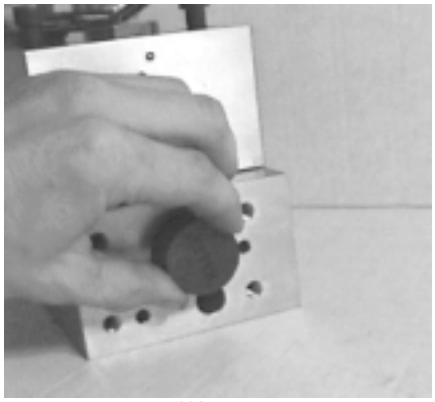
1. Remove orifice plate cover and gasket.



685

2. Remove orifice plate.
3. Remove steel ball and neutral pressure regulating spring.
4. Remove orifice plate gasket.

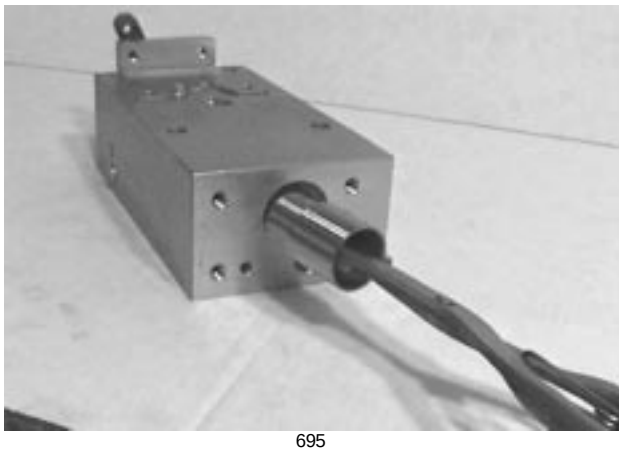
5. Remove rate-of-rise piston.



662

655

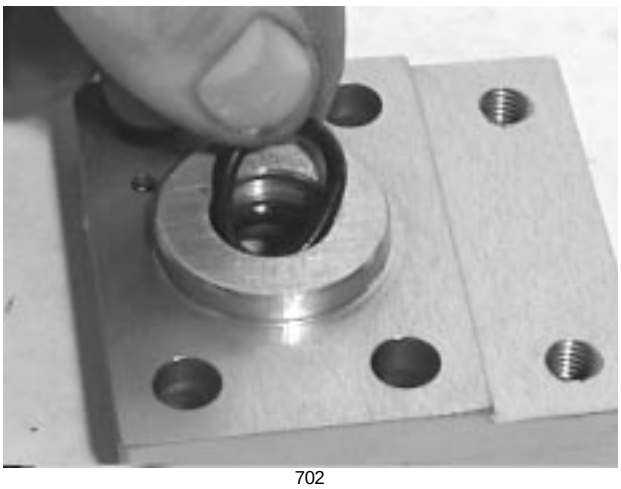
6. Remove pressure regulating springs.
7. Remove pressure regulating piston with an external retaining ring pliers.



695

8. Remove external retaining ring from the lever end of the stem (some models).
9. Remove control lever from stem at the other end of the valve body. It may be necessary to splay the lever to be able to remove it. **DO NOT** apply any impact force to the lever, as the stem or dog-point setscrew might get damaged.
10. Remove the external retaining ring from the stem (some models).
11. Remove the washer (if equipped) and spring(s) from the stem.
12. Remove the second washer from the stem.
13. Remove the cover assembly from the valve body.

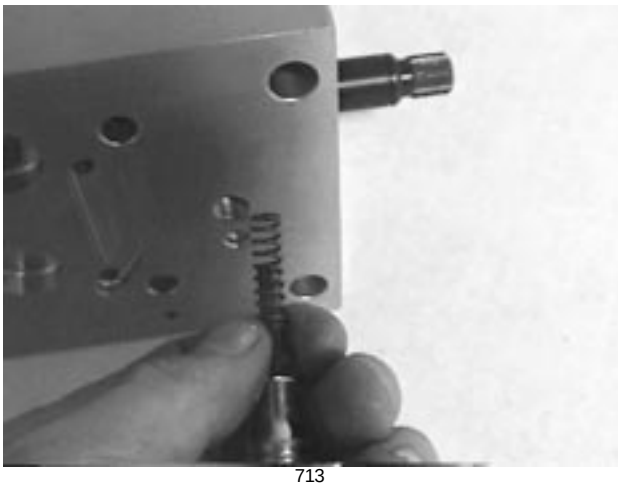
14. Remove the O-ring and oil seal from the cover assembly.



702

15. Remove the two electrical switches from the sides of the valve body and the steel balls from each of the switch bores in the valve body (some models).

16. Remove the detent setscrew, spring, and steel ball from the valve body.



713

17. Remove the dog-point setscrew. Note that the setscrew is retained with MA908 threadlocker.

716

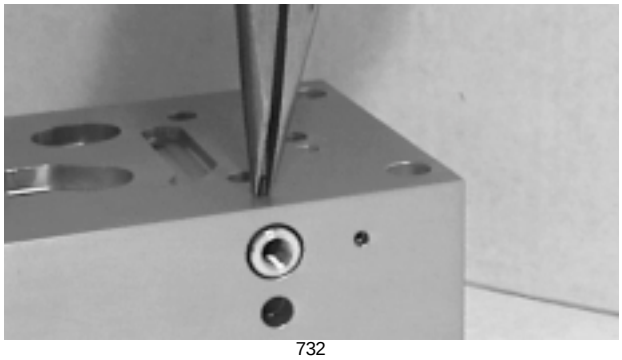
18. Remove the stem from the valve body partially.

19. Remove the thrust washer from the stem.

723

20. Remove the stem from the valve body.

21. Remove the roll pin (retains the shuttle ball seat) with a needle-nose pliers.



732

22. Thread a M8x1.25 screw (one of the cover screws works well) into the seat and remove it from the valve body.

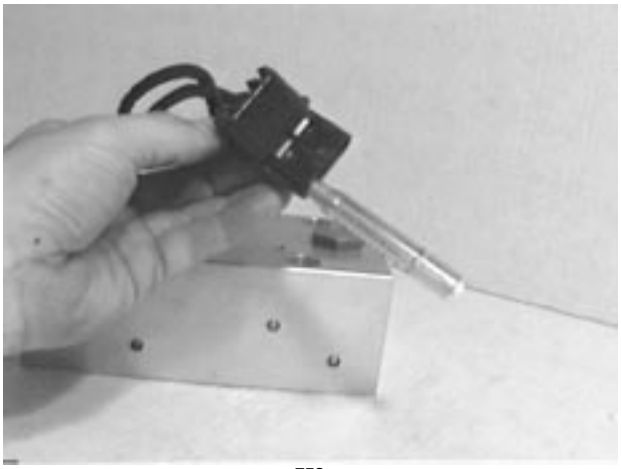
23. Remove the shuttle ball from the valve body.

## B. Disassembly of upper valve body half (electric section)

1. Remove the Weatherpak connector from the valve body by sliding it in the direction of the opening in the shroud.

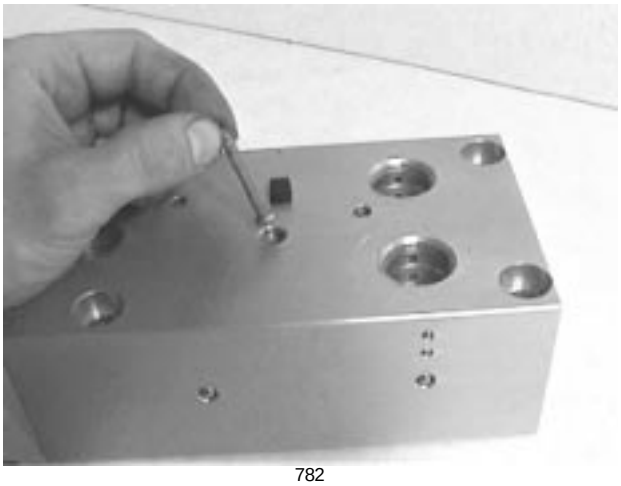
2. Mark the wires with the location letters that are on the Weatherpak connector. Open the end of the Weatherpak connector to allow removal of the pins and wires.

3. Remove the pins (for the wires of all but one solenoid) from the Weatherpak connector using the extraction tool. Tool is Packard Electric P/N 12014012.



758

4. Mark the two solenoids for location identification and remove them.
5. Remove the third (Neutral) solenoid (units with hydraulic lock) or plug (units without hydraulic lock).
6. Remove the filter screen from the valve body.



782

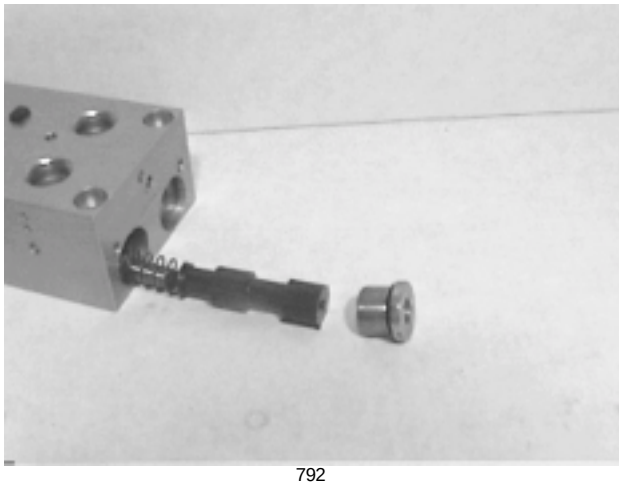
7. Remove the two O-ring plugs from the bores in the end of the valve body.
8. Remove the two spools from the valve body.
9. Remove one dowel pin and spring from each of the spools (hydraulic lock units only).
10. Remove the spool return spring and dowel pin from the bottom of each of the spool bores in the valve body.

## C. Cleaning and Inspection

See Section 7.

## D. Assembly of upper valve body half

1. Install one dowel pin (large diameter) into each of the two bores of the valve body.
2. Install one spring into each of the two bores of the valve body.



792

3. Install one spool into each of the two bores of the valve body.
4. On units equipped with the hydraulic lock feature, install one spring followed by one pin (small diameter) into each of the spools.
5. Install the two O-ring plugs into the valve body and tighten to specification (see Torque Chart).
6. Apply lubricant (such as Dow Corning 200® 30,000cSt fluid) to the O-rings of the solenoids and plug (plug used on units without hydraulic lock). Install solenoids and plug (if equipped) into valve body and torque them to 34 N-m (25 ft-$lb_f$).
7. Insert the wires (pins) into the Weatherpak connector according to the location markings made at disassembly. Close the end of the Weatherpak connector to lock the wires in position.
8. Install the Weatherpak connector onto its retaining clip on the top of the valve body.

## E. Assemble lower valve body half

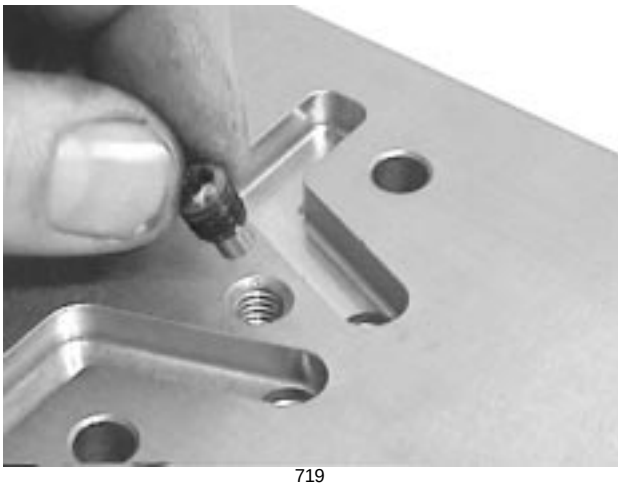
1. Install the steel shuttle ball into its bore in the valve body.
2. Install the O-ring onto the shuttle ball seat.

3. Apply lubricant such as Dow Corning 200® 30,000cSt fluid to the O-ring, and install the seat into the valve body. Be sure to align the roll pin holes in the seat with the holes in the valve body. A M8x1.25 screw threaded into the seat can be used to adjust the seat location in the valve body.

4. Install the roll pin to retain the shuttle ball seat. Drive the roll pin in until it is flush with the gasket surface of the valve body.

5. Install the stem into the valve body, aligning the slot in the stem with the threaded hole in the valve body for the dog-point setscrew. Be sure the slot in the stem is aligned with the setscrew hole in the valve body to prevent damage to the stem and valve body.

6. Apply MA908 threadlocker to the threads of the dog-point setscrew and install. Tighten the dog-point setscrew until snug, then back off 1/2 turn.



719

7. Install the steel detent ball into the valve body.

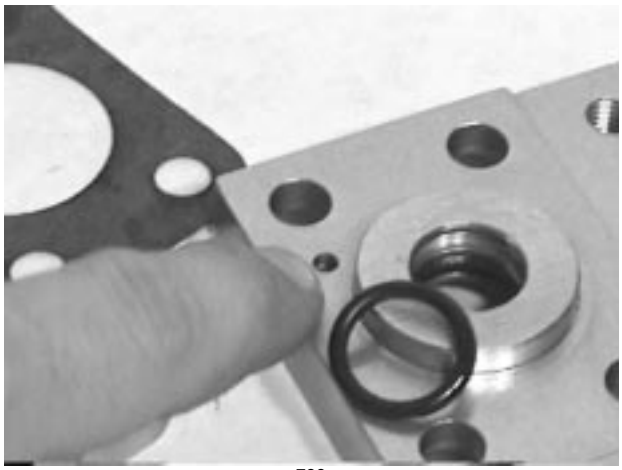
8. Install the detent spring over the detent ball.

9. Apply MA908 threadlocker to the threads of the hollow setscrew and install into the threaded hole. A stepped Allen wrench, or one wrapped with tape will ease the installation of the hollow setscrew. Tighten the setscrew until it is flush with the gasket surface of the valve body. Check the stem rotation and detent action.

715

10. Install the thrust washer over the end of the stem.
11. Press the oil seal into the cover assembly until flush with the adjacent cover surface.
12. Install the O-ring into the counterbore in the cover assembly.
13. Apply grease to the stem, O-ring, and oil seal lip.
14. Install cover assembly and gasket onto valve body. Be sure to align the oil drain hole in the gasket with the hole in the valve body.

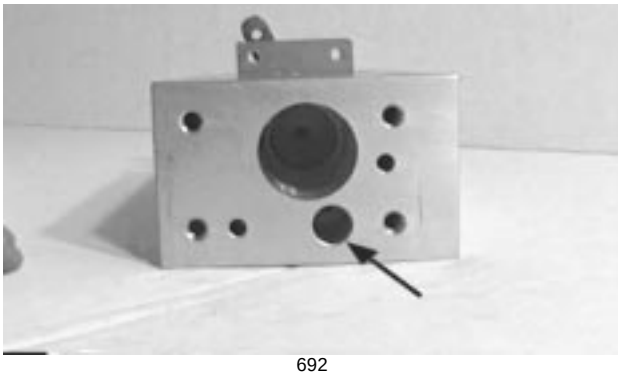
705


706

15. Torque the cover capscrews to specification (see torque chart).
16. Install washer over stem against oil seal.
17. Install spring(s) over stem against washer.
18. Install washer over stem against spring (if equipped).
19. Install external retaining ring onto stem (if equipped).
20. Install lever onto the stem. It may be necessary to splay the lever to be able to install it. **DO NOT** apply any impact force to the lever, as the stem or dog-point setscrew may be damaged. Torque the lever's attaching screw to specification (see Torque Chart).
21. Install external retaining ring onto stem (if equipped).
22. Install the steel balls and electrical switches (if equipped) into the bores in the sides of the valve body. Note that the small diameter ball is inboard of the large diameter ball at each side.
23. Install pressure regulating piston into valve body.
24. Install pressure regulating springs into valve body.

25. Install shims into the bore of the rate-of-rise piston. Install the rate-of-rise piston into valve body.

26. Install neutral pressure regulating spring into the pocket of valve body.



692

27. Install orifice plate gasket onto valve body.

28. Install orifice plate and steel ball onto valve body.

29. Install orifice plate cover and gasket onto valve body.

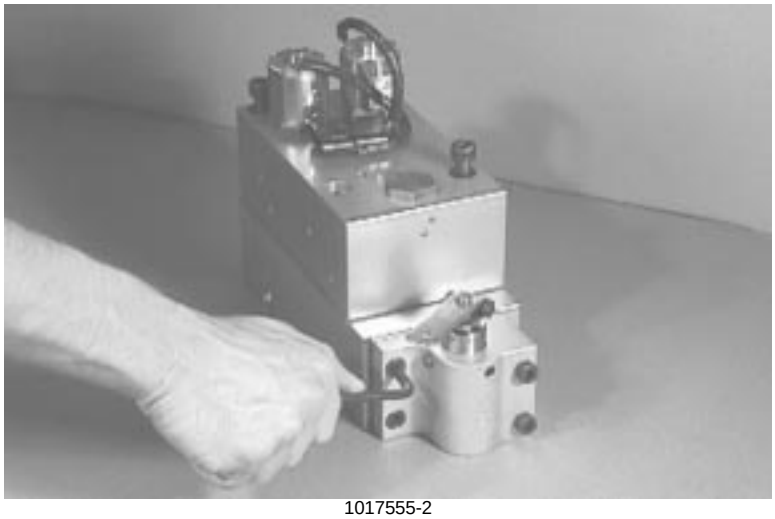
30. Install gasket over lower valve body half.

31. Set upper valve body half over lower valve body half. Insert attaching screws through valve body halves to keep parts in alignment until installation onto the transmission. When installing the valve onto the transmission, be sure to torque the screws to the specification **listed on the valve installation drawing**.

## 8.3 1017555 Trolling Valve

### A. Disassembly

1. Remove the trolling valve attaching screws.

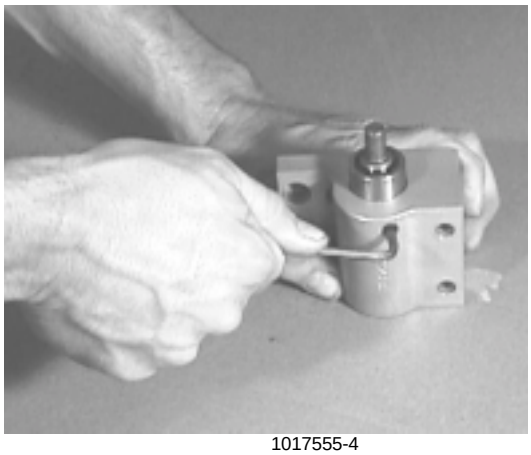


1017555-2

**⚠ CAUTION**

**Steel ball is under pressure from the spring. Care must be taken when removing the trolling valve and orifice plate to prevent loss of steel ball.**

2. Remove the trolling valve from control valve.
3. Remove the gaskets, orifice plate, and steel ball from control valve.
4. Remove the screw and nut clamping the lever to the stem.
5. Remove the lever from the stem. It may be necessary to splay the lever to be able to remove it. **DO NOT** apply any impact force to the lever, as the stem or dog-point setscrew might get damaged.
6. Remove the detent setscrew, spring, and detent ball.

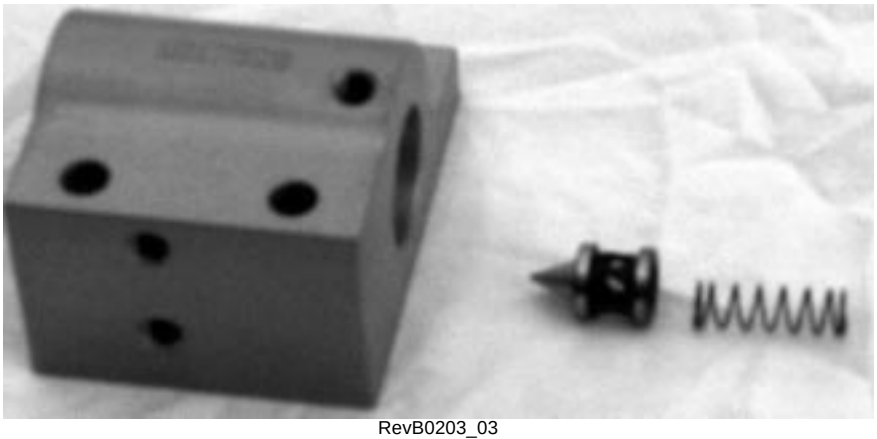


1017555-4

1017555-5

11. Remove the washer from the bore of the housing (some models). Note: the washer may have been removed with the stem and adapter assembly.

12. Remove the (outer) spring and piston from the bore of the housing. Note that there may be washer(s) in the bore of the piston (some models).



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13. Remove the O-ring from the groove and the oil seal from the end of the adapter.

1017555-10

***CLEANING AND INSPECTION***

See Section 7.

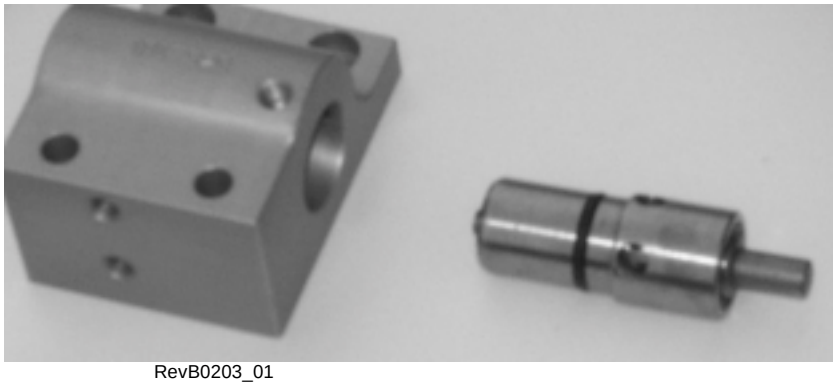
## B. Assembly

1. Press a new oil seal into the counterbore in the end of the adapter. Install a new O-ring into the groove of the adapter.

7. Remove the dog-point setscrew from the valve body.

1017555-6

8. Remove the stem and adapter as an assembly. Note that the inner spring will come out with the stem.



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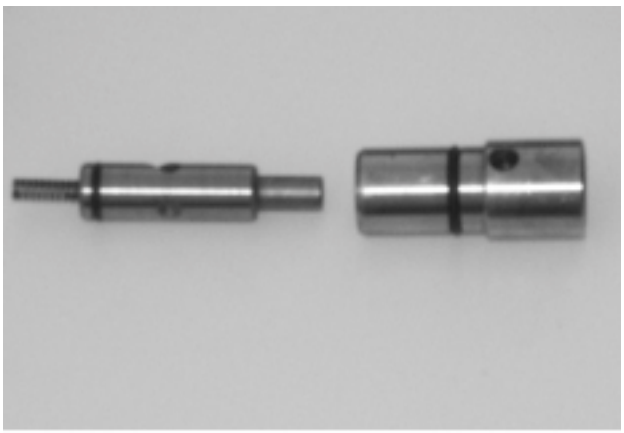
9. Slide the stem out of the adapter by pushing the lever end thru the adapter. Remove the O-ring from the groove in the end of the stem.



RevB0203_02

1017555-12

10. Remove the inner spring and roll pin from the stem only if replacement of parts is necessary. Remove any paint from the large diameter of the stem.

2. Install the roll pin and inner spring onto the end of the stem (if removed). Be sure the first coil of the inner spring is fully seated against the end of the stem.

3. Install a new O-ring into the groove of the stem. Apply grease to the stem from the O-ring groove to the necked-down diameter at the end. .

4. Install the stem into the adapter (insert lever end of stem first) until the stem protrudes through the seal in the adapter.

5. Install the large diameter washer (some models) inside the bore of the adapter until it lays flat on the end of the stem.

6. Install the outer spring into the bore of the piston. Install the small diameter washer(s) (some models) inside the spring in the piston, keeping it centered within the spring. Be sure the washer is at the bottom of the bore in the piston. Place the inner spring, stem, and adapter assembly into the outer spring, and invert the assembly with the piston pointing up.

RevB0203_04

7. Apply grease to the adapter and bore of the valve body and install the adapter and stem assembly with piston into the valve body. Be sure to align the set-screw holes in the adapter with those in the valve body. Rotate the stem if necessary to bring the helical slot into alignment with the dog-point setscrew hole.

8. Apply MA908 threadlocker to the threads of the dog-point setscrew and install. Tighten the dog-point setscrew until snug, then back off 1/2 turn. The end of the setscrew should protrude approximately 3mm from the valve body when the dog point of the setscrew is fully engaged in the helical slot.

1017555-6

9. Check the action of the stem in the trolling valve. If the stem does not rotate 90° smoothly, loosen the dog-point setscrew 1/8 turn and recheck the action of the stem.

10. Install the detent ball and spring into the remaining setscrew hole. Apply MA908 threadlocker to the threads of the detent setscrew and install until flush with the valve body.

1017555-5

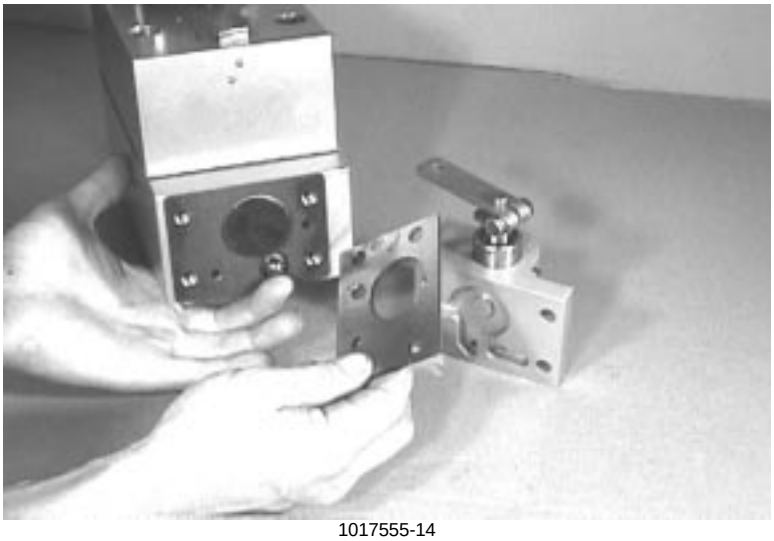
11. Check the torque required to overcome the detent. The torque should be 1.1-1.7 N-m (10-15 in-lb). Adjust the detent setscrew if necessary to achieve the proper torque to rotate the lever out of the detent position.

12. Install the lever on the stem. It may be necessary to splay the lever to be able to install it. **DO NOT** apply any impact force to the lever, as the stem or dog-point setscrew might get damaged.

13. Rotate the lever (if necessary) on the stem to the position shown on the valve installation drawing (see Section 14.10). Install the screw and nut to clamp the lever to the stem. Tighten the screw and nut to specification (see Torque Chart).

14. Install the neutral pressure regulating spring into the bore of the control valve (if removed).

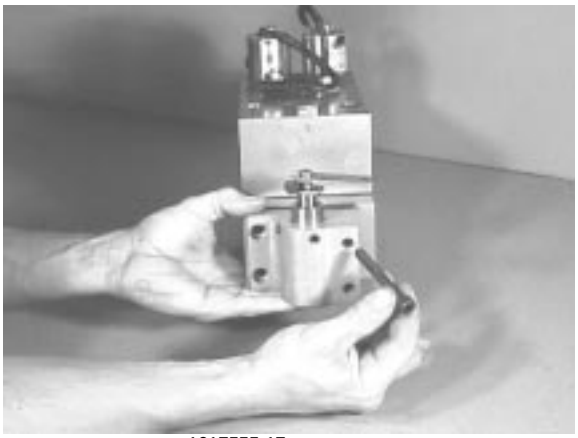
15. Install the steel ball onto the neutral pressure regulating spring.



1017555-14

16. Install the orifice plate gasket, orifice plate, trolling valve gasket, and trolling valve onto the control valve. Install the attaching screws and torque them to specification (see Torque Chart).

1017555-3



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Section 9

# Assembly

*NOTE: The MG-5205SC (except assemblies 1014841 and 1015389), MG5202DC, MG5203SC, and MG5204SC require the use of an SKF THAP 300 Oil Injection Kit (see Section 11, Special Tools) or similar device to assemble the output shaft.*

*NOTE: The illustrations used in this manual are of the MG5202SC transmission. Mg5202DC, MG5203SC, and MG5204SC transmissions are similar.*

## 9.1 Prior to Assembly

1. Place all tapered roller bearing cones in a 120° C (250° F) oven for a minimum of one hour prior to installation.
2. Submerge all new friction clutch plates in transmission oil for a minimum of one hour prior to installation.
3. Place the cups for the front pinion bearings on the primary and secondary pinions; and the cups for the front and rear tapered roller bearings on the output shaft in a deep freeze [-51° C (-60° F)] for at least two hours prior to assembly.

***NOTE: In the discussion that follows, the input side of the transmission is the front and the output side is the rear. Left and right sides are determined by facing the output side of the transmission.***

## 9.2 Assembly

1. Lay the transmission on blocking with rear side up.
2. Install dust plug into input shaft front bearing area using a soft hammer.
3. Install chilled cups for front tapered roller bearings on primary and secondary pinions into bores in front inner face of housing. Use driver T18050-610 to press/drive cups to bottom of bore.

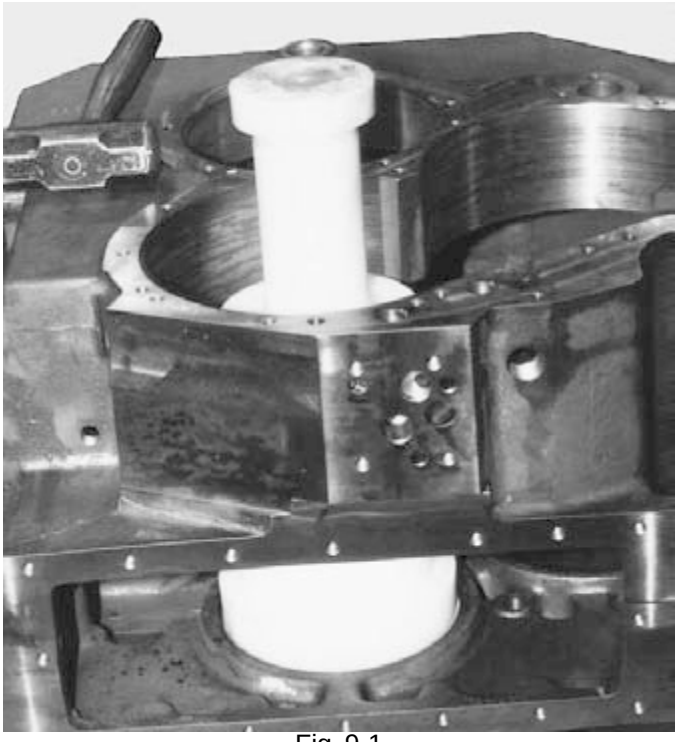


Fig. 9-1

4. Measure and record the distance from the machined surface of the housing to the bottom of the bearing cup bore where the oil shield contacts (dimension “A”). Measure and record the thickness of the oil distribution shield at the outer edge (dimension “B”). Measure and record the width of the bearing cup (dimension “C”).

5. Install oil distribution shield into output shaft front bearing bore. Be sure shield is properly centered.

6. Install chilled front output tapered roller bearing cup into housing bore. Use driver T18050-611 to press/drive cup to bottom of its bore.

***NOTE: Care must be taken to ensure that the shield remains centered.***

7. Place a 250 mm (9.85 in.) dia. x 13 mm (1/2 in.) thick steel plate over the bearing cup. Place a suitably sized puller inside the housing to push on the steel plate. The puller yoke must span the opening of the transmission housing. Tighten puller rod to standard torque limit for thread size of puller rod or 275 N-m (200 ft-lb), whichever is less. Maintain this torque until bearing cup and housing temperatures equalize (approx. 10 minutes).

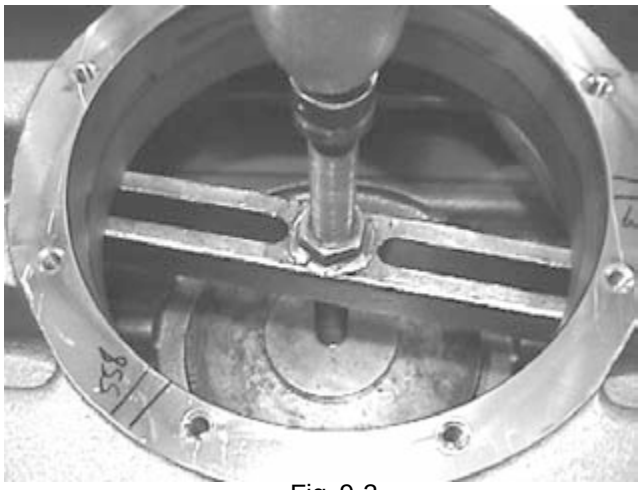


Fig. 9-2

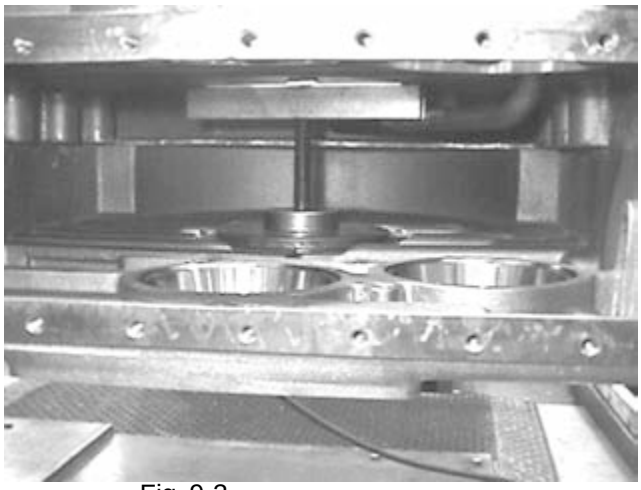


Fig. 9-3

8. Remove puller and steel plate. Measure and record the distance from the machined surface of the housing to the top of the bearing cup (dimension “D”). Dimension “D” **must** equal dimension “A” minus dimension “B” minus dimension “C” within 0.025 mm (0.001 in.).

## 9.3 Installation of Output Shaft and Gear

**Model MG5202SC, assemblies 1014841 and 1015389 only**

1. Turn housing over so that the input side is up.

2. Clean tapered surface of output shaft and tapered bore of output gear. Use OSHA approved cleaning solvent to remove all traces of dirt, grease, oil, etc.

Wipe surface with clean paper towel. Do not touch cleaned surfaces.

**⚠ CAUTION**

**Tapered surface of shaft and matching tapered bore of gear must be completely free of grease, oil, dirt or solvent residue. Failure to properly clean mating parts could prevent proper advance of gear on shaft and adversely effect torque carrying capacity of the assembled joint.**

3. Preassembly procedure to determine advance during assembly of output shaft and gear.

   A. Stand output shaft upright withh front end up (splined end down). Measure distance from front end of shaft to to shoulder at large end of taper. Record this distance as dimension “C”. See fig 9-4. B. Measure width of output gear at tapered hub. Record this distance as dimension “B”. See fig 9-5.

Fig. 9-4

Fig. 9-5

C. Seat output gear on taper of output shaft. Apply 890 N to 1340 N (200 lbs to 300 lbs) of thrust on gear to seat gear on shaft taper. Measure distance from front end of shaft to face of gear hub. Record this distance as dimension “A”.

D. Calculated expected advance = C - (A + B). Calculated advance should be 3.04 mm to 3.86 mm (0.120 in. to 0.152 in.). See fig 9-6.

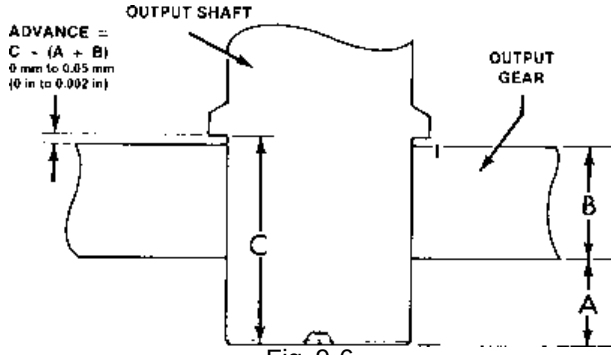



Fig. 9-6

*NOTE: Should the calculated advance fall outside the range given above, check to assure that all measurements and calculations are correct. If no errors are found and the expected advance is out of tolerance, it will be necessary to change parts. Contact the Product Service Department at Twin Disc, Incorporated for assistance.*

*NOTE: Assembly of the output shaft and gear in a MG5202 SC transmission will require a press with at least 1557 kN (175 ton) capacity. A fixture to hold the output shaft in a rigid position perpendicular to to press bed during the assembly process must also be available. The fixture specified in the instructions following fits a 1779kN (200 ton) Enerpac press. Shops possessing different equipment must design a similar fixture that will fit the equipment available.*

4. Install press fixture T-18196-6 on bed of hydraulic press (see note above).

5. Place output shaft in fixture with splined end down.

output shaft.

B. If gear is square on the shaft as confirmed by the dial indicator readings above, apply additional press force up to 1557 kN to 1779 kN (175 tons to 200 tons) to fully advance the output gear to the shaft shoulder. Recheck to assure that the gear has been advanced to within 0.05 mm (0.002 in.) of shaft shoulder.

C. If output gear cannot be advanced to shaft shoulder, or if gear is cocked on output shaft, contact the Product Service Department at Twin Disc, Incorporated for further information.

10. Install retaining ring in groove at front end of output shaft (some models). Install with shamfer away from bearing.

11. Remove housing, shaft, and gear from press. Use wood blocking inside housing to hold output shaft and gear against front tapered roller bearing. Lay housing on blocking (or assembly stand) with input side up.

12. Apply anaerobic sealant (Twin Disc part number M2828) around O.D. of cup plug and install in housing bore at front end of output shaft. Install with cup side up, flush with front face of housing.

Fig. 9-8

13. Turn housing over so that output side is up. If using blocking, block securely and high enough to permit installation of gear pan capscrews and washers. Remove blocking (holding gear and shaft against front output bearing) from inside housing.

14. Install gear pan assembly with caged nuts toward the front. Pan must be “rolled” in around output gear to proper position. Install attaching screws with a seal

washer under each screw's head. Torque the screws to specification (see Torque Chart).

**Model MG5202SC (except assemblies 1014841 and 1015389), MG5202DC, MG5203SC, and MG5204SC**

1. Turn housing over so that the input side is up. Install the input oil seal using tool T-18050-699.
2. Clean tapered surface of output shaft and tapered bore of output gear. Use OSHA approved cleaning solvent to remove all traces of dirt, grease, oil, etc. Wipe surface with clean paper towel. Do not touch cleaned surfaces.

**⚠ CAUTION**

**Tapered surface of shaft and matching tapered bore of gear must be completely free of grease, oil, dirt or solvent residue. Failure to properly clean mating parts could prevent proper advance of gear on shaft and adversely effect torque carrying capacity of the assembled joint.**

3. Coat the tapered surface with thin oil (such as SKF mounting fluid).
4. Install oil shield, bearing and output gear. Use a board for shallow case models or special tool T19987 (for deep case) to position gear into correct location. Install the output shaft into the output gear in the transmission housing. Seat shaft onto the taper of the gear using only the weight of the shaft.
5. Use gauge blocks and a feeler gauge to measure between the output gear and shaft shoulder. This is the potential advance. The advance for shallow case models must be 6.86mm to 8.38 mm (0.270 in. to 0.330 in.). Deep case models must be 9.52 mm to 11.05 mm (0.375 in. to 0.435 in.). See figure 9-6.

   *NOTE: Should the calculated advance fall outside the range given above, check to assure that all measurements and calculations are correct. If no errors are found and the expected advance is out of tolerance, it will be necessary to change parts. Contact the Product Service Department at Twin Disc, Incorporated for assistance.*
6. Connect the oil injector to the output shaft.

6. Using a board, slide the output gear (small diameter end of tapered bore up) into housing so that the bore of the gear aligns with the bore in the housing for the output shaft. Transport housing and gear to the press.

**⚠ WARNING**

**Use care when transporting housing with output gear inside. Keep housing level so gear does not slide out. Failure to do so could cause damage to parts and/or injury to personnel.**

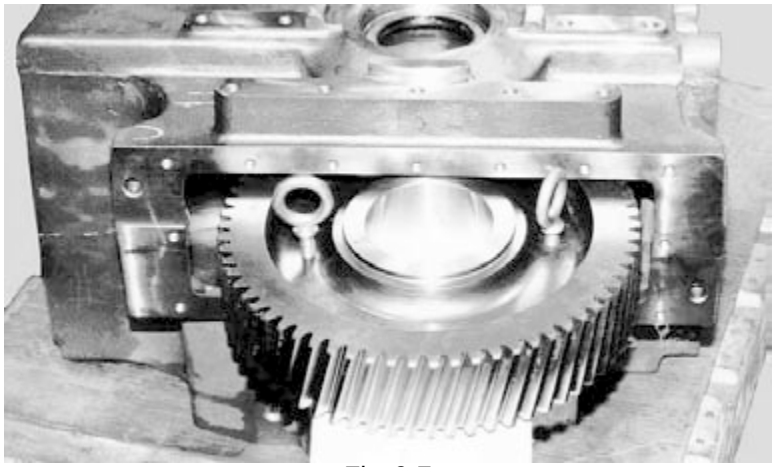


Fig. 9-7

7. Lift housing and output gear (keeping them level) over output shaft (previously installed in fixture in press). Lower housing and gear over output shaft so that shaft enters bores of housing and gear. Lower housing approximately half way.

8. Place tapered roller bearing (small OD end up) on front end of output shaft. Keep housing level and lower until housing is resting on bearing.

9. Center shaft/housing under press keeping housing level. Use tool T-18196-6 through bore in housing at front end of output shaft to push bearing onto shaft. Lower housing as pressure is applied to bearing. After bearing is fully seated against gear, continue applying pressure to approximately 890 kN (100 tons). Release pressure on bearing and turn gear and shaft 180°. Reapply pressure up to 810 kN to 1210 kN (91 tons to 136 tons) to complete advance of gear onto output shaft. Release pressure and use taper gauge or feeler gauge to assure that gear has been advanced to within 0.05 mm (0.002 in.) of shaft shoulder.

*NOTE: If gear has not been advanced to within 0.05 mm (0.002 in.) of shaft shoulder, proceed as follows:*

A. Install a dial indicator with probe contacting a machined surface of the output gear face. Zero the indicator and mark a starting position on the gear face. Rotate the output shaft, observing the dial indicator for indication that thte output gear is cocked on the output shaft. Dial indicator vasriations in excess of 0.06 mm (0.003 in.) as the shaft is turned indicate the gear is cocked on the

7. Use portable press (1340 kN [150 ton] capacity) and fixture T20023 to seat hub using 1340 N (300 lbf) load.

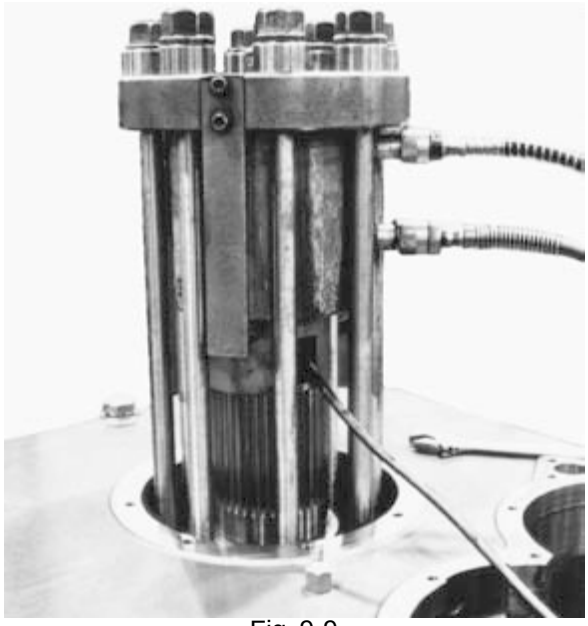


Fig. 9-9

8. Inject oil with a viscosity of 300 $mm^2/S$ (300cSt) at room temperature (mounting fluid) into the shaft until it leaks out of both ends of the mating surfaces.
9. Advance gear to shaft shoulder stop with the portable press.
10. Release injection oil pressure between the mating surfaces and wait five minutes before lowering the press force and removing the assembly tool.
11. Check actual advance. See fig. 9-6.

## 9.4 Installation of Rear Output Shaft Bearing

1. Install heated rear output shaft tapered roller bearing. Install with small O.D. of bearing to the rear. Press/drive bearing to shaft shoulder using special tool T18050-606 for shallow case and T18050-96 for deep case units. After bearing cools, press/drive bearing down again to assure that bearing is against shaft shoulder.
2. For deep case models, install chilled cup into output seal carrier using tool T18050-116. For shallow case models, push cup to seat against cone (installed above).

## 9.5 Output Shaft Tapered Roller Bearing Adjustment

1. To set output shaft bearing clearance. proceed as follows.

**Model MG5202SC, MG5203SC, and MG5204SC**

A. Develop an estimated shim pack

(1.) Use a depth micrometer and measure the distance from the rear face of housing to the cup of output shaft rear tapered roller bearing. Record this reading as dimension “A”.

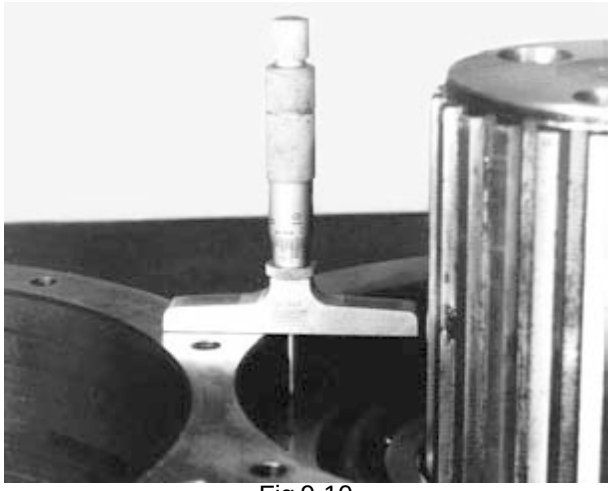


Fig 9-10

(2.) Use a depth micrometer and measure the distance from the pilot of the seal carrier to the mounting flange. Record this reading as dimension “B”.

Fig 9-11

(3.) A - B = Bearing clearance without shims.

(4.) Use necessary shims to develop a shim pack that will reduce the endplay to 0.05 mm to 0.15 mm (0.002 in. to 0.006 in.).

B. Install shim pack and seal carrier (without seals or O-ring). Install the seal carrier attaching screws and torque to specification (see Torque Chart).

C. Install lifting fixture T21397 onto rear of output shaft. Apply 1340 N to 4000 N (300 lbs to 900 lbs) of downward force on rear end of output shaft. Seat front bearing by rotating shaft several revolutions with weight applied.

D. Install dial indicator onto the housing with finger resting on rear of output shaft or on lifting fixtures. Minimum of 2224 N (500 lbs) lifting force is required to overcome weight of gear and shaft and still exert a minimum of 1334 N (300 lbs) lifting force on bearing. Zero the dial indicator and mark the spot where the reading was taken.

E. Using a hoist, exert 2225 N to 4000 N (500 lbs to 900 lbs) of lifting force onto the shaft. Rotate the shaft several revolutions with lifting force applied. Stop rotation with dial indicator finger on mark previously made, continuing to hold lifting force. Read shaft endplay on dial indicator. It should be 0.05 mm to 0.15 mm (0.002 in. to 0.006 in.).

F. Release upward force. Apply downward force and rotate the shaft several revolutions. Stop rotation with dial indicator finger on mark. Dial indicator should again read zero. If total endplay is out of tolerance, add or remove shms as necessary to achieve a measured endplay of 0.05 mm to 0.15 mm (0.002 in. to 0.006 in.).

**Model MG5202DC**

A. Install seal carrier without seals or O-ring. Secure seal carrier with capscrews using very little torque on capscrews. Use a taper gauge or feeler gauge to measure gap between rear housing face and flange of output seal carrier. Build a trial shim pack of thickness equal to gap plus 0.50 mm (0.020 in.). Install the shim pack.

B. To lift output shaft, install eyebolts and strap to rear of output shaft. Apply 1340 N to 4000 N (300 lbs to 900 lbs) of downward force on rear end of output shaft. Seat front bearing by rotating shaft several revolutions with weight applied.

C. Install dial indicator onto the housing with finger resting on rear of output shaft or on lifting fixtures. Minimum of 2224 N (500 lbs) lifting force is required to overcome weight of gear and shaft and still exert a minimum of 1334 N (300 lbs) lifting force on bearing. Zero the dial indicator and mark the spot where the reading was taken.

D. Using a hoist, exert 2225 N to 4000 N (500 lbs to 900 lbs) of lifting force onto the shaft. Rotate shaft several revolutions with lifting force applied. Stop rotation with dial indicator finger on mark previously made, continuing to hold

lifting force. Read shaft endplay on dial indicator.

E. Make a shim pack to decrease endplay to 0.05 mm to 0.15 mm (0.002 in. to 0.006 in.). Install shim pack between seal carrier and housing.

F. Repeat steps B through D until endplay is between 0.05 mm to 0.15 mm (0.002 in. to 0.006 in.).

2. Remove lifting fixture. Remove capscrews and remove output seal carrier.

3. Install O-ring in groove in O.D. of output seal carrier.

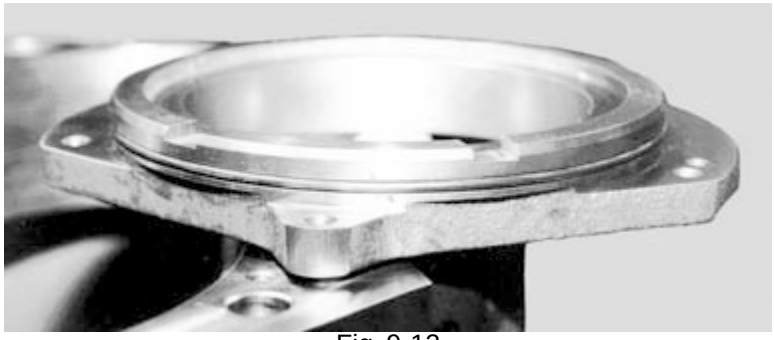


Fig. 9-12

4. Install oil seals into output seal carrier using driver T18050-120. Note: Coat O.D. of seals with M2828 anaerobic sealant prior to installation. Remove excess sealant that is wiped off as seals are pressed into position.

A. Install forward seal with spring-loaded lip toward the inside of the transmission. Install flush with inner face of seal carrier.

B. Install rear seal with spring-loaded lip of seal toward rear of the transmission. Install flush with outer face of seal carrier.

C. Pack area between the seals with water pump grease.

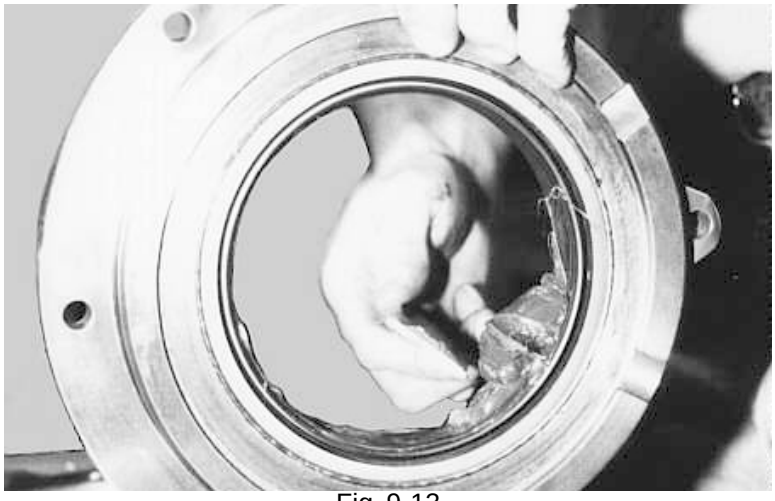


Fig. 9-13

D. Install grease fitting if not previously installed.

5. Install established shim pack.

6. Install assembled output seal carrier onto housing. Install attaching screws and torque to specification (see Torque Chart).

## 9.6 Installation of Top Cover Asembly and Oil Gauge

1. Turn transmission over and block securely to rest in upright position.

3. Install top cover gasket. Install the attaching screws and torque to specification (see Torque Chart).

4. Install breather-filler cap.

5. Install oil gauge tube assembly and oil level gauge. Verify that the oil gauge tube assembly did not enter the output gear pan opening.

## 9.7 Assembly and Installation of Primary and Secondary Shaft

1. Assembly of transfer gear to secondary shaft.

A. Clean taper on secondary shaft and tapered bore in transfer gear using OSHA approved cleaner. Wipe dry with clean paper towels. Do not touch cleaned tapers.

B. Determine if secondary shaft and transfer gear can be advanced properly:

(1.) Hold secondary shaft in a vertical position standing on its front end.

(2) Use a depth micrometer and measure distance from the rear end of the shaft to the shaft shoulder at small end of taper. Record this distance as dimension “A”.

(3) Install secondary transfer gear on secondary shaft taper, small diameter of tapered bore up. Seat gear on shaft taper with 445 N to 890 N (100 lbs to 200 lbs) of force.

(4) Use a depth micrometer and measure distance from rear end of shaft to machined face of transfer gear at small diameter of tapered bore. Record this distance as dimension “B”.

(5) Calculate expected advance: Expected advance = A - B . Calculated advance must be 2.56 mm to 3.38 mm (0.101 in. to 0.133 in.). If calculated advance is not within the range, recheck all measurements and calculations for

errors. If no errors are found, contact the Product Service Department at Twin Disc, Incorporated for information.

C. Set secondary transfer gear on fixture T18050-609 with large diameter of tapered bore up. Move fixture and transfer gear to a press with at least 445 kN (50 tons) capacity.

D. Install secondary shaft front end up, into tapered bore of transfer gear. Seat shaft in tapered bore of gear by applying 445 N to 890 N (100 lbs to 200 lbs) downward force on shaft.

E. Center fixture, gear and shaft under ram of press and apply approximately 276 kN to 409 kN (31 tons to 46 tons) of force on front end of secondary shaft. Release pressure and turn fixture, shaft and gear 180°. Reapply pressure to complete advance.

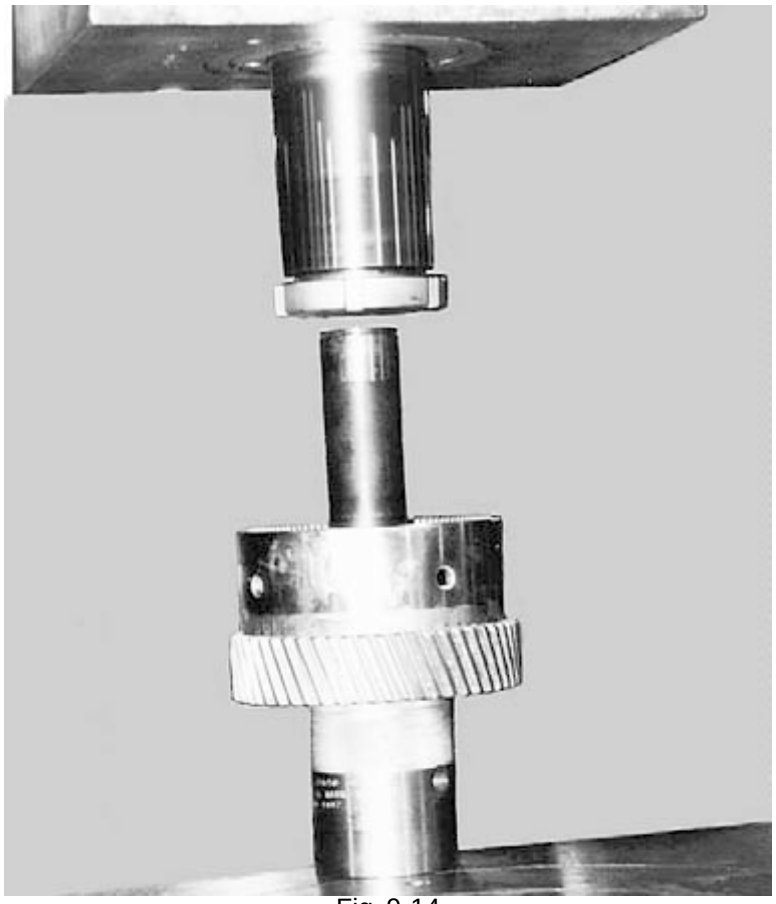


Fig. 9-14

F. Using a depth micrometer, measure distance from rear end of shaft to face of transfer gear. Record as dimension “C”. Transfer gear face should be

within 0.05 mm (.002 in.) of the shaft shoulder at the small diameter end of the taper.

***NOTE: Actual advance (C-B) must be 2.56 mm to 3.38 mm (0.101 in. to 0.133 in.).***

***NOTE: If transfer gear has not been advanced as specified above, contact the Product Service Department at Twin Disc, Incorporated for information.***

2. Install piston seal ring into groove in secondary shaft. Apply a coat of assembly grease or oil to seal ring.

3. Install piston ring in groove in O.D. of clutch apply piston. Apply a coat of assembly grease or oil to seal ring.

4. Install clutch apply piston into piston bore in transfer gear.

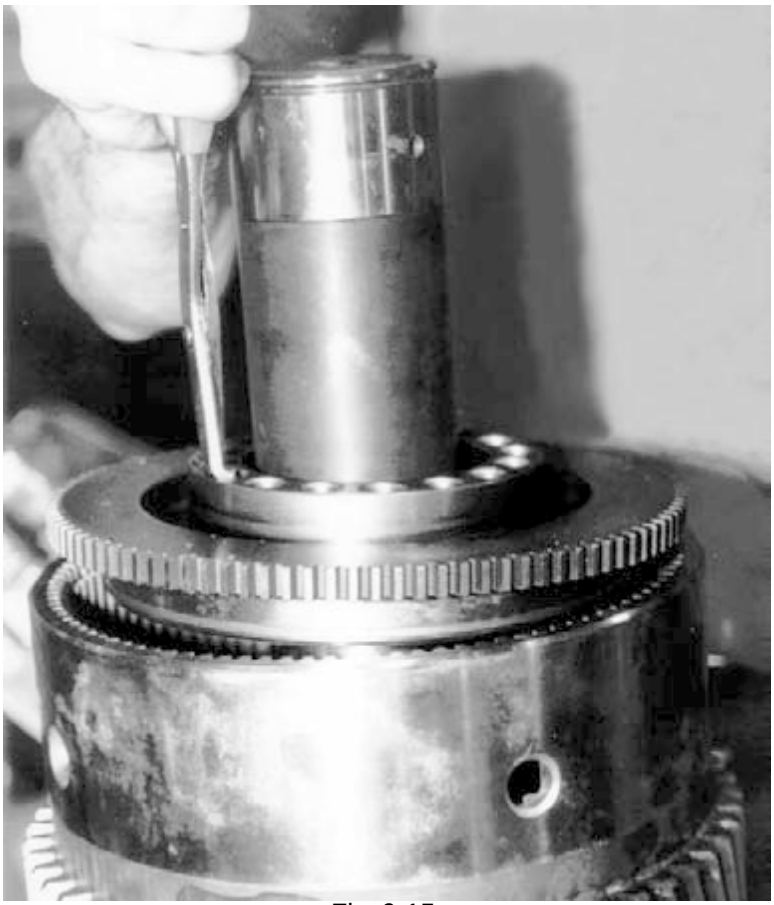


Fig. 9-15.

5. Installation of clutch return springs.

   A. Install 16 clutch return spring assemblies into pockets in face of clutch apply piston. (Each assembly consists of one inner and one outer spring.)

   B. Install spring retainer over springs with groove toward springs. Working through holes in retainer, use a small punch or probe to assure that all springs

are in pockets in face of piston and that springs are aligned correctly (stand straight up).

Fig. 9-16

C. Install external retaining ring over shaft to rest against spring retainer. Move shaft assembly to press and install tool T19998. Exert force on tool T19998 to compress springs and expose snap ring groove of shaft. Keep force on springs and install retaining ring into exposed groove of shaft.

Fig. 9-17

D. Slowly release force on springs assuring that spring retainer counterbore covers snap ring and prevents retaining ring from coming out of the groove. Remove tool T19998.

6. Use driver T18050-152 and hydraulic press to press rear tapered roller bearing cone onto secondary shaft. Install bearing with large O.D. toward transfer gear and press to seat against transfer gear.

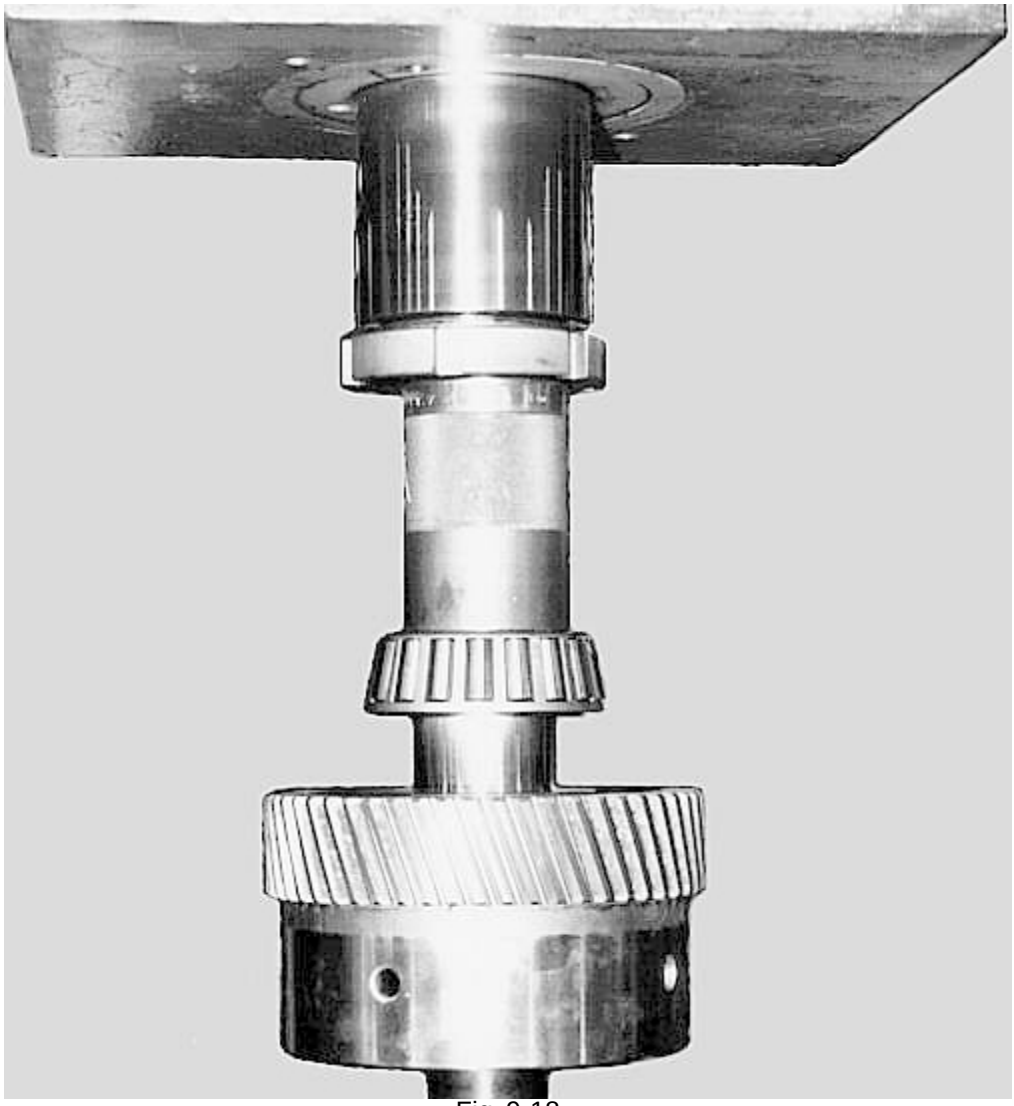


Fig. 9-18

7. Install external retaining ring. Assemble tapered edge side away from bearing.
8. Beginning with a friction plate alternately install 11 friction plates and 10 steel plates into clutch drum and against clutch apply piston (fig. 9-18).
9. Install the shim plate (some models). Check Bill of Material to determine if shim plates are to be used. Shim plates were used with the 1014866 and 1014867 transfer gears which have a 104.9 mm to 105.2mm (4.130 in. to 4.140 in.) distance from the bottom of the gear (where the clutch piston fits) to the top edge of the retaining ring groove.

10. Install clutch backplate and internal retaining ring.

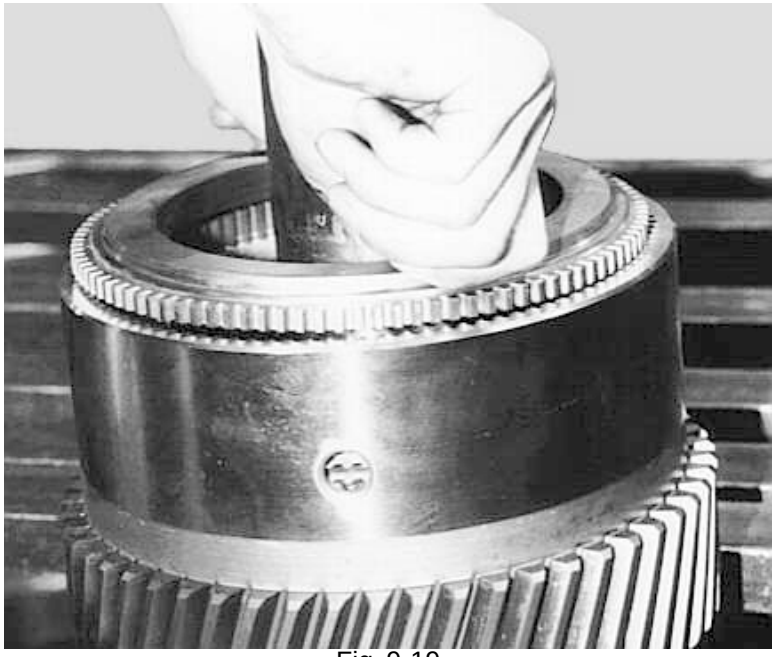


Fig. 9-19

11. Install tapered roller bearing cone onto secondary shaft. Install with large diameter of bearing seating against shoulder of shaft inside the transfer gear opening.

***NOTE: This bearing is a slip fit and will not require special tools for installation.***

12. Assembly of pinion.

    A. Use special tool T18050-607 to install chilled tapered roller bearing cup into rear of pinion for secondary shaft. Bearing cup is installed with small I.D. of

taper toward the front and seated against shoulder of bore in clutch hub.

Fig. 9-20

B. Install chilled roller bearing into bore at front of pinion.

C. Install internal retaining ring into groove in pinion bore.

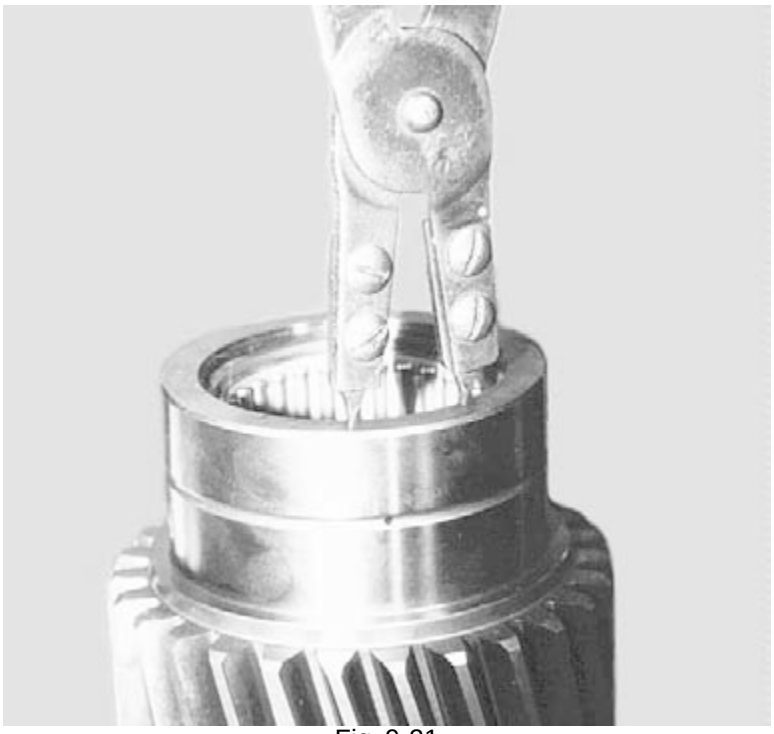


Fig. 9-21

D. **Some 1014841 assemblies only:** Press front tapered roller bearing cone for secondary pinion onto bearing spacer. Install bearing with large diameter pressed to shoulder of bearing spacer. Refer to Bill of Material to determine if a spacer is to be used, and also Tech Talk 98-005 for more information about pinion spacer usage.

E. Align plates in clutch pack and install pinion on secondary shaft so that external teeth on clutch hub mesh with internal teeth of steel plates in clutch pack. Assure that clutch hub is in mesh with all plates.

F. Install external retaining ring to retain pinion on shaft.

Fig. 9-22

13. Install two piston rings into grooves at rear end of shaft.

14. Assemble primary shaft. Assembly procedure for primary shaft is exactly the same as for the secondary shaft. Repeat above procedure in steps 1 through 13.

15. Install forward tapered roller bearing cones for primary and secondary pinions

onto cups previously installed in bearing bores in front of transmission housing.

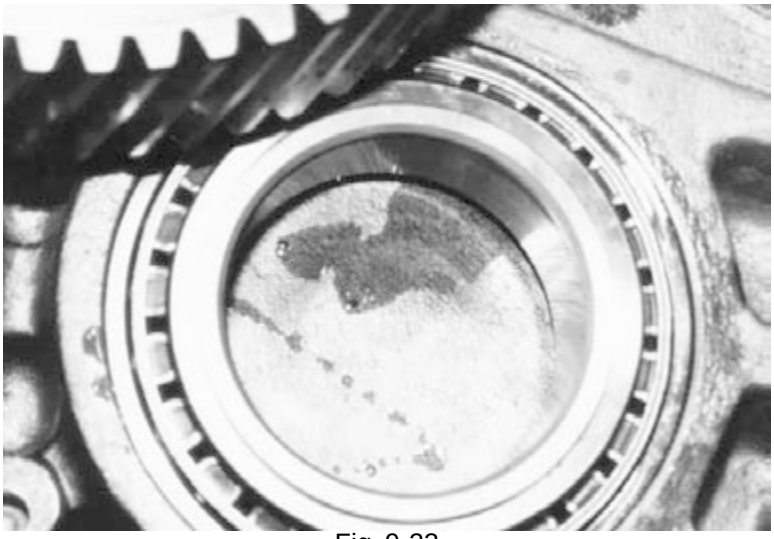


Fig. 9-23

16. Install primary and secondary shaft assemblies into the transmission housing.

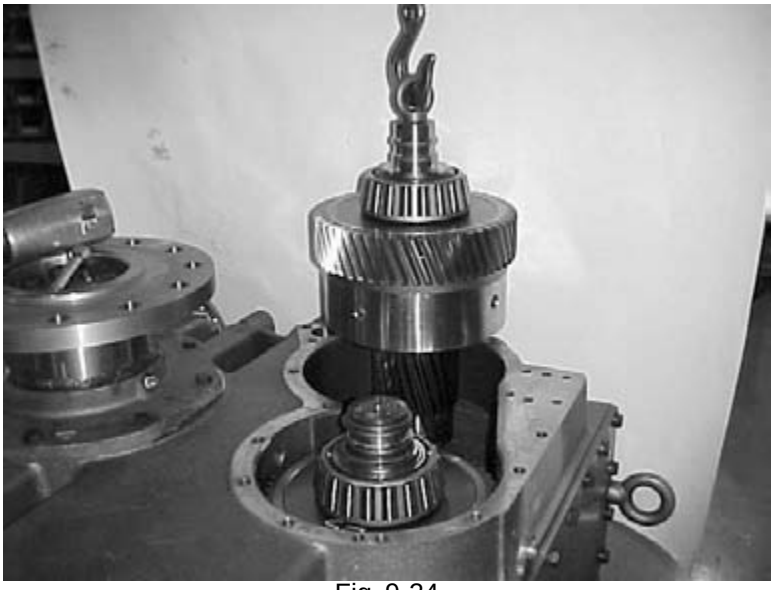


Fig. 9-24

## 9.8 Installation of Bearing Carrier

1. Install bearing carrier gasket over dowels onto rear face of housing. Install with silicone beaded side up.
2. Assemble lube relief valve spring and lube relief valve steel ball into lube relief valve housing. Attach assembled lube relief valve to inner face of bearing carrier

with the screws and washers. Torque the screws to specification (see Torque Chart).

3. Install two alignment studs into face of transmission housing. Install bearing carrier over studs and onto dowels in housing face. Use a soft hammer (near the dowels) to seat carrier against gasket and over dowels.

Fig. 9-25

4. Install lube tube through “keyed” hole in bearing carrier and into machined pocket in front inner face of housing. Rotate tube so elongated “key” of tube fits into corresponding “key” in bearing carrier. Properly installed lube tube will be flush with rear face of bearing carrier.

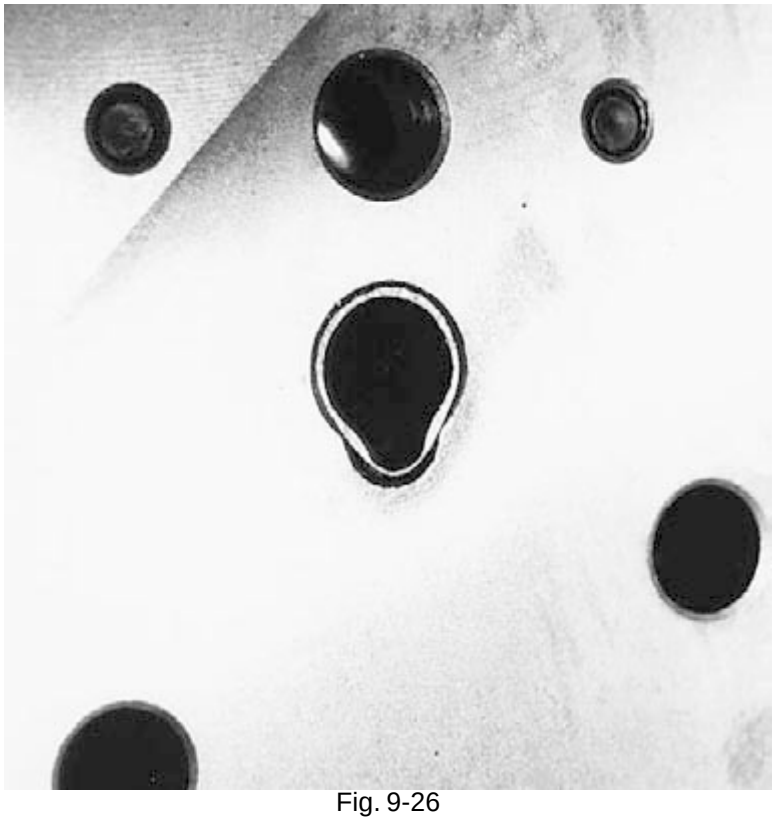


Fig. 9-26

5. Install cups for rear tapered roller bearings on primary and secondary shafts into bores in bearing carrier. Tap cups down gently with soft hammer or brass drift to seat against bearing cones on shafts.

6. Install manifold gasket over alignment studs and against bearing carrier. Install with silicone beaded side up.

7. Push tapered roller bearing cups, with shim retainers, firmly against roller bearing cones on rear of primary and secondary shafts. Use a depth micrometer to measure from manifold gasket face to shim retainers. Measured distance is shaft endplay. Use necessary shims to develop a shim pack for each shaft to reduce shaft endplay to 0.05 mm to 0.15 mm (0.002 in. to 0.006 in.).

8. Install calculated shim pack at each shaft location:

   On units without roll pins in the shim retainers, install thickest shim against bearing cup, install remaining shims, then retainer agaist shims at each shaft.

   On units with roll pins in the shim retainers, place the shim retainers against the bearing cup and the shims over the roll pins. Orient the shim retainers of both clutch shafts such that the roll pins are all in a single line. This is required to ensure the roll pins fit into the cast pockets of the manifold.

## 9.9 Assembly and Installation of Manifold

1. Install new O-rings onto the plugs used for the clutch and lube pressure test ports Lubricate and install the plugs, torquing them to specification (see Torque Chart).

2. Assemble and install filter bypass valve. Assemble parts in maifold oil inlet port in the following order:

   (A.) Check ball

   (B.) Spring

   (C.) Plug

3. Install assembled manifold over alignment studs and dowels. Use a soft hammer (near the dowels) to seat manifold against gasket and over dowels. Install manifold attaching screws and torque to specification (see Torque Chart).

**Models MG5203SC and MG5204SC:**

Apply MA908 to the threads of the two MA960C (see transmission assembly drawing) manifold attaching screws and torque to specification (see Torque Chart).

## 9.10 Primary and Secondary Shaft Bearing Adjustment

*NOTE: Procedure for setting and checking endplay for primary and secondary shafts is the same. Procedure described and illustrated is for the secondary shaft. Repeat same procedure for the primary shaft.*

1. With a felt-tip pen, make a mark across the rear end of the secondary shaft.
2. Install a dial indicator on a machined surface on the manifold with the probe resting on the mark made on the secondary shaft.

Fig. 9-27

3. Install an eyebolt into the end of the shaft and exert 890 N (200 lbs) downward force while rotating the shaft several revolutions in each direction. Stop so that the dial indicator probe is resting on the mark.
4. Zero the dial indicator.
5. Remove downward pressure and exert 1334 N to 1557 N (300 lbs to 350 lbs) lifting force on the shaft. Rotate the shaft several revolutions in each direction stopping with the dial indicator probe resting on the mark.
6. Dial indicator reading is secondary shaft endplay. Endplay should be between 0.05 mm to 0.15 mm (0.002 in. to 0.006 in.). Add or remove shims as necessary to achieve correct endplay. Use dial indicator and above procedure to confirm that desired endplay has been attained.

7. Check endplay for primary shaft. Repeat steps 1 through 6 above to adjust endplay for primary shaft.

Fig. 9-28

## 9.11 Installation of Manifold Exterior Components

1. Install pump suction strainer into bore in manifold.
2. Install O-ring into groove in suction screen cover. Apply assembly grease to the O-ring.
3. Install suction screen cover and secure with clamp plate and screw. Torque attaching screw to specification (see Torque Chart).
4. Install O-ring into groove in face of manifold at primary shaft location. Install cover onto manifold at primary shaft bore. Install attaching screws and torque to specification (see Torque Chart).

Fig. 9-29

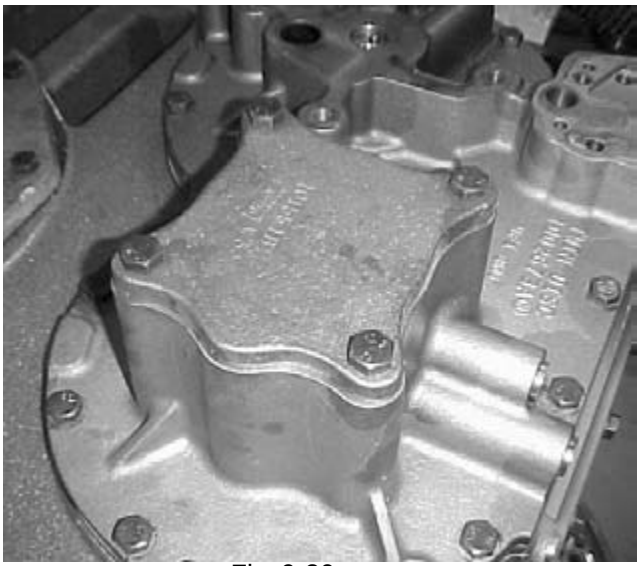


Fig. 9-30

6. Install oil pump gasket and oil pump at mounting location at end of secondary shaft. Mesh drive tang on pump shaft with drive slot in secondary shaft. Install attaching screws and torque to specification (see Torque Chart).

7. Install oil filter.

## 9.12 Installation of Output Flange

**If your output shaft is splined, follow these instructions:**

1. Heat output flange in 300° F (150° C) maximum oven for a half hour to an hour.

2. Install heated output flange. Assure that flange seats solidly against rear tapered roller bearing on output shaft.

3. With a depth micrometer, measure distance from rear face of output flange to end of output shaft. Record this distance as dimension “A”. Measure distance from rear face of output flange to inner shoulder of flange against which retainer washer is installed. Record this distance as dimension “B”. Determine gap between retainer washer and end of shaft by subtracting dimension “B” from dimension “A”.

Fig. 9-31

Use shims to develop a shim pack to reduce gap between retainer washer and end of shaft to 0.076 mm to 0.152 mm (0.003 in. to 0.006 in.).

4. Install O-ring to seal output shaft splines and output flange.

5. Install shim pack (developed in step 3) and retainer washer. Install retainer

washer attaching screws and torque to specification (see Torque Chart).

6. Attach dial indicator to housing with probe resting on face of output flange. Locate indicator probe as close to O.D. of flange as possible. Check flange face runout by rotating flange. Total indicated runout must not exceed 0.10 mm (0.004 in.).

7. Attach dial indicator to housing with probe resting on O.D. of output flange pilot. Check pilot runout by rotating output flange. Total indicated runout must not exceed 0.10 mm (0.004 in.).

   *NOTE: Should total dial indicator runout exceed 0.10 mm (0.004 in.) proceed as follows:*

   A. With a felt-tip pen, draw a line across the end of the output shaft and face of output shaft counterbore to mark original installed position of the output flange versus the output shaft.

   B. Remove the output flange as described in Section 6 and reinstall 90° from original position. Recheck runout of flange face and flange pilot using procedures in steps 6 and 7 above. If runout is within specification, do nothing more.

   C. If runout continues to exceed tolerance, repeat procedure in (B) above at positions 180° and 270° from originally installed output flange position. Stop at whatever position output flange runout is no more than 0.10 mm (0.004 in.).

   D. If output flange runout cannot be reduced to acceptable tolerances, contact the Product Service Department at Twin Disc, Incorporated for information/recommendations.

**If your output shaft is tapered, follow these instructions:**

1. Clean tapered surface of output shaft and tapered bore of output gear. Use OSHA approved cleaning solvent to remove all traces of dirt, grease, oil, etc. Wipe surface with clean paper towel. Do not touch cleaned surfaces.

**⚠ CAUTION**

**Tapered surface of shaft and matching tapered bore of flange must be completely free of grease, oil, dirt or solvent residue. Failure to properly clean mating parts could prevent proper advance of flange on shaft and adversely effect torque carrying capacity of the assembled joint.**

3. Coat the tapered surface with thin oil (such as SKF mounting fluid).

4. Place the output flange onto the output flange. Seat flange onto the taper of the shaft using 1340 N (300 lbs) force.

5. Use gauge blocks and a feeler gauge to measure between the output shaft end and flange shoulder. This is the potential advance. The advance for the output flange 6.32mm to 8.13 mm (0.249 in. to 0.320 in.).

   *NOTE: Should the calculated advance fall outside the range given above, check to assure that all measurements and calculations are correct. If no errors are found and the expected advance is out of tolerance, it will be necessary to change parts. Contact the Product Service Department at Twin Disc, Incorporated for assistance.*

6. Connect the oil injector to the output flange.

7. Install tool T21397 onto output shaft to pull output flange onto output shaft.

8. Inject oil with a viscosity of 300 $mm^2/S$ (300cSt) at room temperature (mounting fluid) into the shaft until it leaks out of both ends of the mating surfaces.

9. Tighten the screws to advance flange shoulder to shaft end while injecting oil.

10. Release injection oil pressure between the mating surfaces and wait five minutes before removing tool T21397.

11. Check actual advance by confirming that flange has been pulled onto shaft until flange shoulder is within 0.00 mm to 0.05 mm (0.000 in. to 0.002 in.) of shaft end.

12. Attach dial indicator to housing with probe resting on face of output flange. Locate indicator probe as close to O.D. of flange as possible. Check flange face runout by rotating flange. Total indicated runout must not exceed 0.10 mm (0.004 in.).

13. Attach dial indicator to housing with probe resting on O.D. of output flange pilot. Check pilot runout by rotating output flange. Total indicated runout must not exceed 0.10 mm (0.004 in.).

    *NOTE: Should total dial indicator runout exceed 0.10 mm (0.004 in.) proceed as follows:*

    A. With a felt-tip pen, draw a line across the end of the output shaft and face of output shaft counterbore to mark original installed position of the output flange versus the output shaft.

    B. Remove output flange as described in Section 6 and reinstall 90° from original position. Recheck runout of flange face and flange pilot using procedures in steps 12 and 13 above. If runout is within specification, do nothing more.

    C. If runout continues to exceed tolerance, repeat procedure in (B) above at positions 180° and 270° from originally installed output flange position. Stop at whatever position output flange runout is no more than 0.10 mm (0.004 in.).

D. If output flange runout cannot be reduced to acceptable tolerances, contact the Product Service Department at Twin Disc, Incorporated for information/recommendations.

## 9.13 Installation of Transmission External Components

1. Assemble selector valve. See Section 8, Subassemblies.
2. Install selector valve gasket and ditch plate (some models). Torque capscrews to specification (see Torque Chart, unless torque is specified on selector valve).

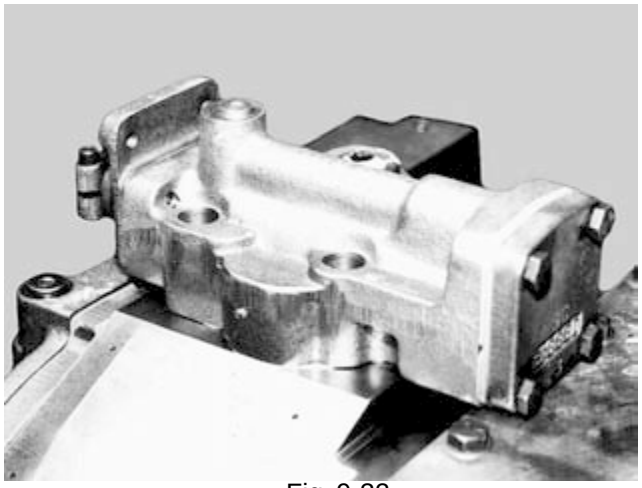


Fig. 9-32

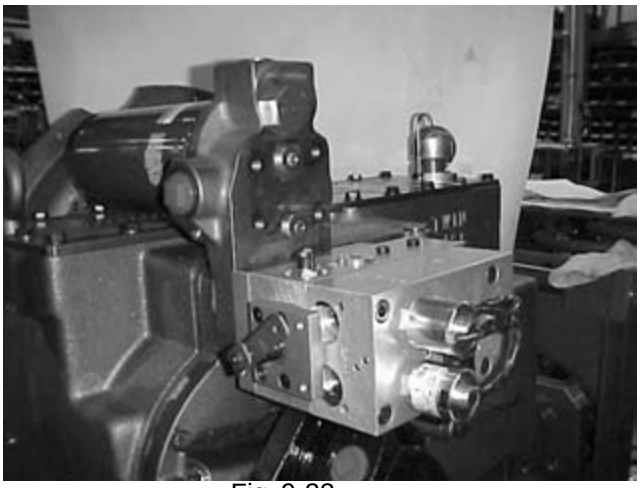


Fig. 9-33

3. Turn transmission over, supporting it by the output side (input side up).
4. Coat input seal bore of housing and outside diameter of input seal with a thin film of M2828 anaerobic sealant (do not apply excessive sealant, as seal and/or bearings may be damaged). Verify that there is no M2828 sealant on primary shaft. Apply a film of oil or assembly grease to the seal surface of the primary shaft (most models). Install input shaft oil seal into housing using appropriate driver protector/driver T18050-696, T-18050-722, or T-21347/T-21347-1 (tool usage depends on model). Press oil seal into bore with the spring-loaded lip of seal toward the inside of the housing. Press seal into bore until outer face is flush with adjacent face of housing.
5. Install front housing onto transmission housing. Install attaching screws and torque to specification (see Torque Chart).

6. Attach a dial indicator to the input shaft spline using fixture T21302-1 with the probe on the front housing machined face. Rotate input shaft and note total indicator runout. The runout must not exceed 0.42 mm (0.016 in) for both a SAE #0 and SAE #1 housing.

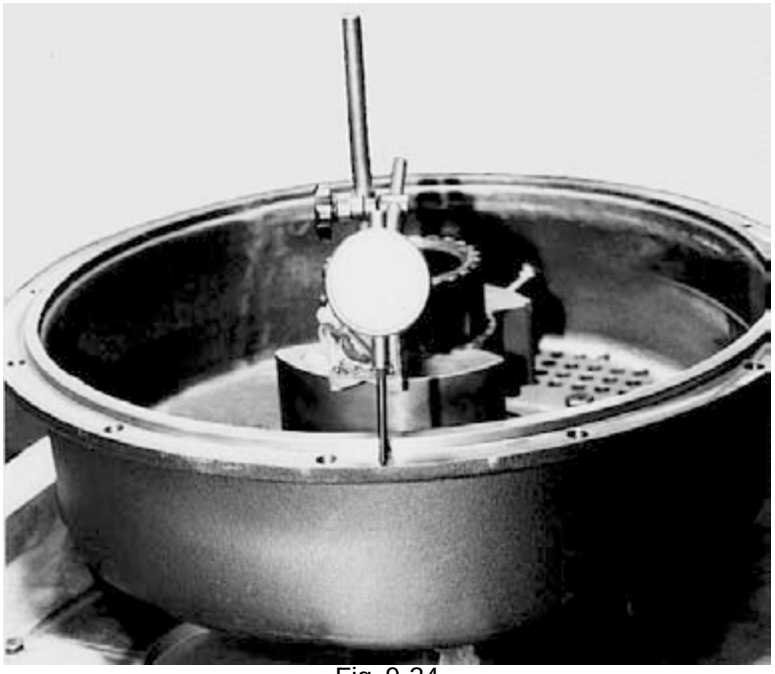


Fig. 9-34

7. Attach a dial indicator to the input shaft spline using fixture T21302-1 with the probe on the O.D. of the front housing pilot. Rotate input shaft and note total indicator runout. The runout must not exceed 0.30 mm (0.012 in) for both a SAE #0 and SAE #1 housing.

*NOTE: Should total indicator runout exceed stated limits, contact the Product Service Department of Twin Disc, Incorporated for information and recommendations.*

Section 10

# Installation

## 10.1 Prior to Installation

**⚠ CAUTION**

**Most Twin Disc products mount directly onto the flywheel of the engine. Flywheel-to-driven component interference is possible due to mismatch of components or other reasons. Therefore, engine crankshaft endplay as well as flywheel alignment checks must be made before the driven component is installed.**

After installation of the driven component, crankshaft endplay **must** be measured again. Endplay at the second measurement must be the same as the first. A difference in these two endplay measurements is an indication of interference. Consequently, the driven component **must** be removed and the source of interference found and corrected.

Twin Disc will not be responsible for system damage caused by engine to Twin Disc component interference regardless of the cause of interference. This engine crankshaft endplay check is considered mandatory.

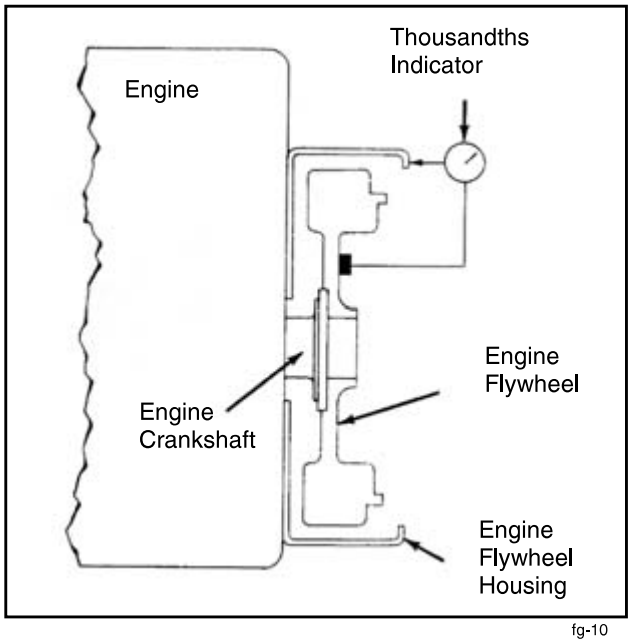
The transmission housing flange and pilot, the engine flywheel and the flywheel housing must be checked for trueness. Make certain the engine flywheel and the flywheel housing are clean prior to making the tests.

**NOTE:** To isolate engine vibration and prevent transferring it to the hull through the propeller shaft, the distance from the marine gear output flange to a fixed stuffing box or the first fixed bearing must be a minimum of 20 times the shaft diameter. If the distance is less than this, a flexible coupling may be necessary to isolate the engine vibration.

## 10.2 Engine Runout Checks (Also reference SAE J-1033 and J-617)

1. Bolt a thousandths increment dial indicator to the engine flywheel so that the indicator is perpendicular to the face of the engine flywheel housing, and the indicator stem is riding on the face of the flange. See Figure 10-1.

Fig. 10-1 Checking flywheel housing flange for deviations.

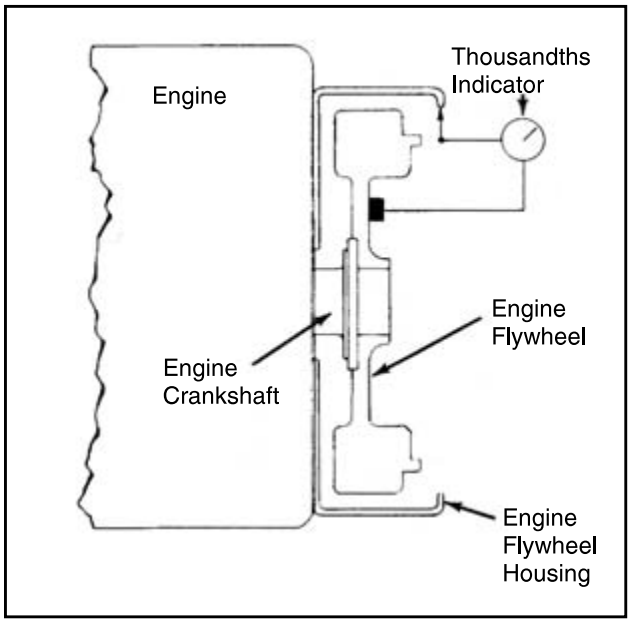



fg-10

Rotate the engine flywheel, always keeping a thrust in the same direction, and note the face deviation of the engine flywheel-housing flange. The face deviation must not exceed 0.41 mm (0.016 in.).

2. With the indicator mounted as in the above paragraph, adjust the indicator stem so that it will ride on the bore of the engine flywheel housing. See Figure 10-2.

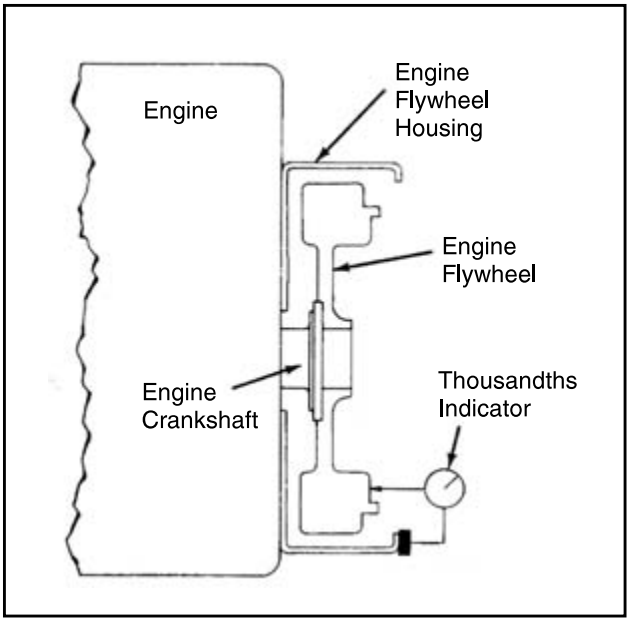
Fig. 10-2 Checking flywheel housing bore eccentricity.




Rotate the engine flywheel and note the bore eccentricity of the engine flywheel-housing bore. The bore eccentricity must not exceed 0.41 mm (0.016 in.).

3. Bolt a thousandths dial indicator to the engine flywheel housing so that the indicator is perpendicular to the engine flywheel, and the indicator tip is riding on the face of the flywheel. See Figure 10-3.

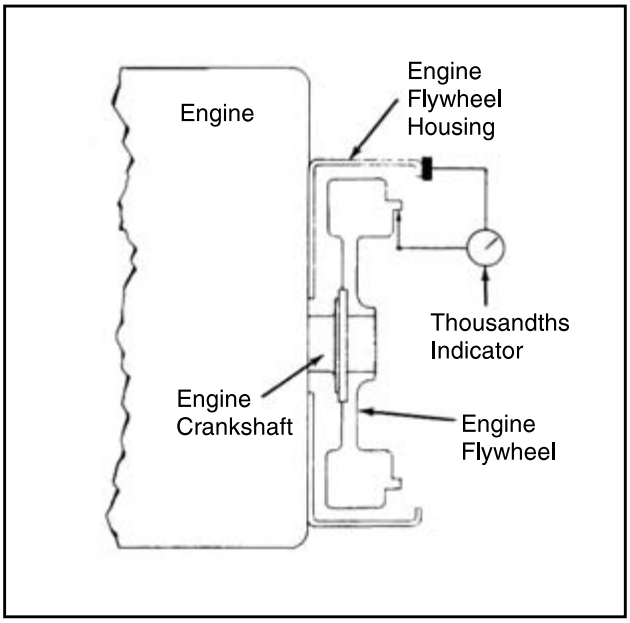
Fig. 10-3 Checking flywheel face runout.



Rotate the flywheel. The variation of the face runout of the surface to which the driving ring is bolted should not exceed 0.013 mm (0.0005 in) per inch of diameter. Thrust on the flywheel should be in one direction at all times to obtain a correct reading.

4. With the indicator mounted as in the paragraph above, adjust the indicator tip so that it will ride on the driving ring pilot bore of the engine flywheel. See Figure 10-4.

Fig. 10-4 Checking flywheel pilot ring bore eccentricity.




Rotate the flywheel. The driving ring pilot bore eccentricity of the engine flywheel should not exceed 0.13 mm (0.005 in) maximum total indicator reading.

## 10.3 Installation

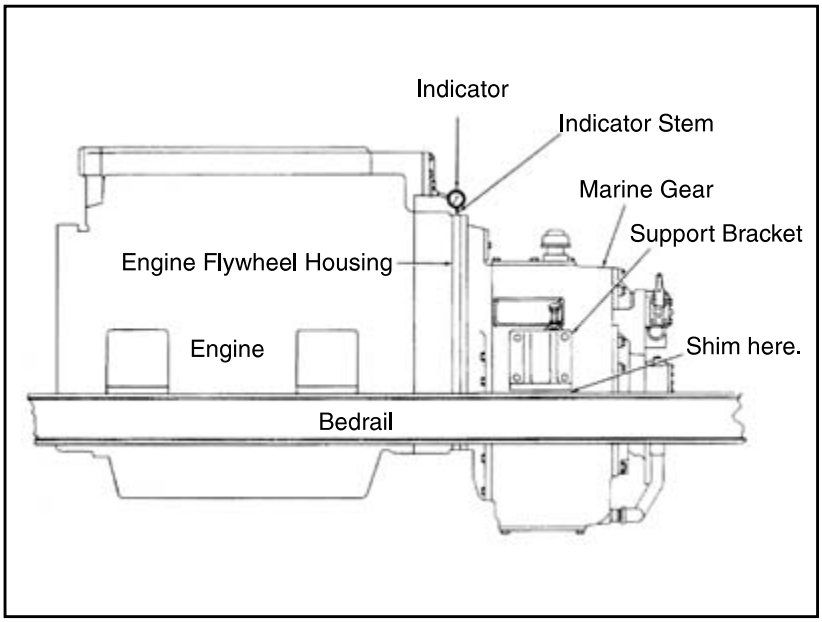
### A. Alignment

Proper alignment of an engine and marine transmission is critical, both during the initial installation and at frequent intervals during the life of the boat. It is rather common for a boat to change its form with various loads and with age. Engine and shaft alignment can also change on a boat due to varying loads and the boat's age. The following steps may be taken to secure proper marine transmission alignment.

When reinstalling a marine gear after a repair, or when installing a new marine gear to an engine already mounted in the bedrails, the flywheel housing should be checked for deflection using the following procedure:

Install the mounting brackets on the side mounting pads of the marine gear. Install the driving ring on the engine flywheel. Bolt an indicator to the engine block and set the indicator stem on the engine flywheel housing.

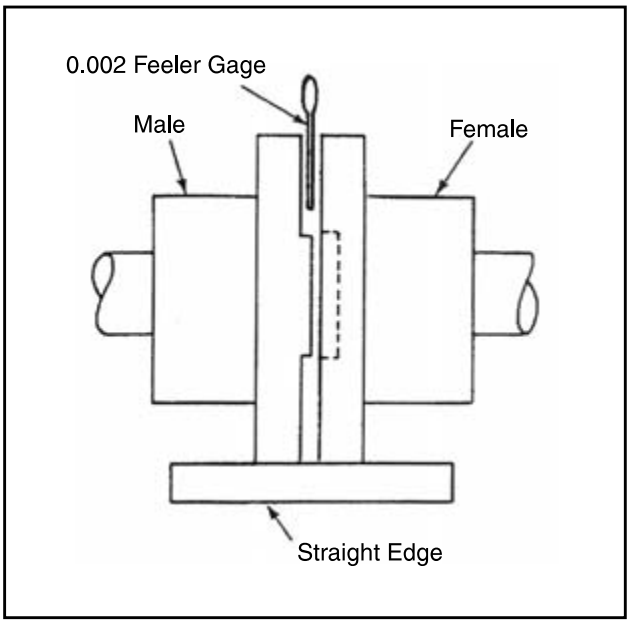
Fig. 10-6 Checking for housing deflection.




fg-10

Set the indicator gauge at zero (0). Lift the marine gear with a hoist, or other suitable means, and place the unit in position against the engine flywheel housing. Secure the flange of the marine gear main housing to the engine flywheel housing. Use a feeler gauge to measure the space between each mounting bracket and engine bedrail. Add shims between the brackets and bedrails to equal the feeler gauge readings. Carefully release the lifting force on the marine gear. The indicator gauge must remain steady at the zero mark. Torque bed bolts to proper rating. If the reading moves from zero, lift the marine gear and insert additional shims. Continue this procedure until the marine gear is completely at rest on the bedrails and the gauge maintains a steady zero reading. After obtaining the correct zero reading, the mounting brackets can be secured to the engine bedrails. How-

Fig. 10-8 Checking parallel alignment of the coupling.




fg-10

As the engine and marine transmission come into their aligned position, it will be possible to match the output flange and propeller coupling, and prepare for bolting together. Care should be taken not to burr or mar this connection because the fit is very critical. Place a 0.05 mm (0.002 in) feeler gauge between the flanges of the coupling. Move (slide) the feeler gauge completely around the coupling.

Rotate the marine transmission flange coupling 90, 180 and 270 degrees. Move the feeler blade around the flange again in each successive position. If the alignment is correct, the feeler gauge will fit snugly, with the same tension, all around the flange coupling.

If the alignment varies during rotation, then additional alignment is necessary, or the marine transmission and shaft couplings should be checked for improper face runout. See Figures 10-9 and 10-10. Runout must not exceed 0.10 mm (0.004 in). Face runout on the matine transmission output flange can usually be corrected by repositioning the flange on its spline or taper. Shaft coupling runout could be due to inaccuracy of taper fit, key interference, or bent flanges.

ever, before the mounting brackets are secured to the engine bedrails, the propeller shaft should be checked for alignment.

**NOTE:** The transmission output flange and companion flange bolts must be torqued to specifications found in Section 12.

### B. Propeller Shaft

Before any attempt to align the engine and gearbox to the propeller shaft, proper alignment of the propeller shaft must be determined. This includes alignment of the propeller shaft through all struts and intermediate bearings. Failure to align the propeller shaft may result in premature wear on bearings, vibration and a possible shaft or other machinery failure.

If the length of the shaft from the last support bearing to the gearbox is excessive or a flexible stuffing box is used, the shaft must be centered prior to engine and gearbox/propeller shaft alignment.

## 10.4 Engine and Marine Transmission Alignment

**⚠ CAUTION**

When mounting the engine and transmission in the boat, all of the mounting pads on the transmission must be used. Failure to do so may result in damage to the transmission.

**It is important to align the engine and transmission only when the boat is afloat, and NOT in dry-dock.** During this alignment period, it is also advisable to fill the fuel tanks and load the boat in the typical manner that it is used. Some boats are built with flexibility and may change shape as loading varies.

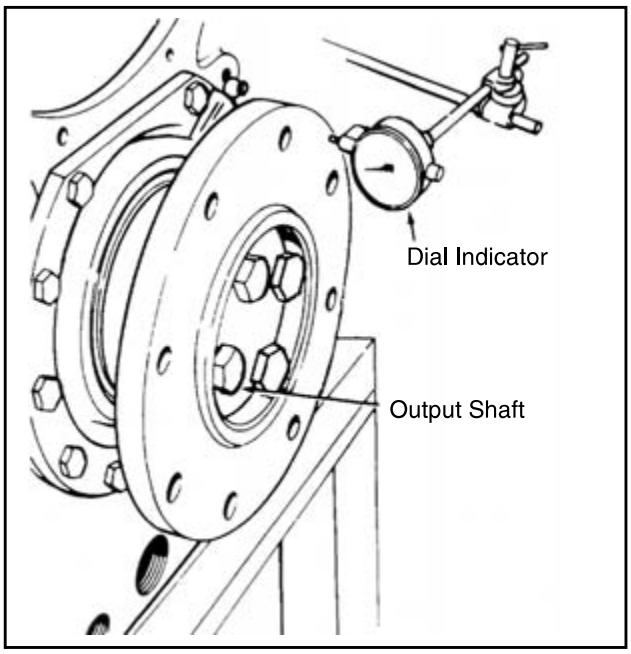
When a heavy boat is dry-docked, it naturally undergoes some bending. Therefore, it is always good practice to unbolt the marine transmission coupling to prevent bending of the shaft.

With the engine and transmission in position on the engine bed, arrangements must be made to have a controlled lifting or lowering of each of the four corners of the engine. If threaded holes are provided in each of the engine mounts, jacking screws can be used in them. The engine can be raised by screwing down, or lowered by backing off the desired amount.

Steel plates must be inserted under the jacking screws so that the bolts will not damage the engine bed. Lifting can also be accomplished by the use of chain hoists or properly placed jacks. Adjustable shims also are available and can simplify the alignment process, particularly for future realignment.

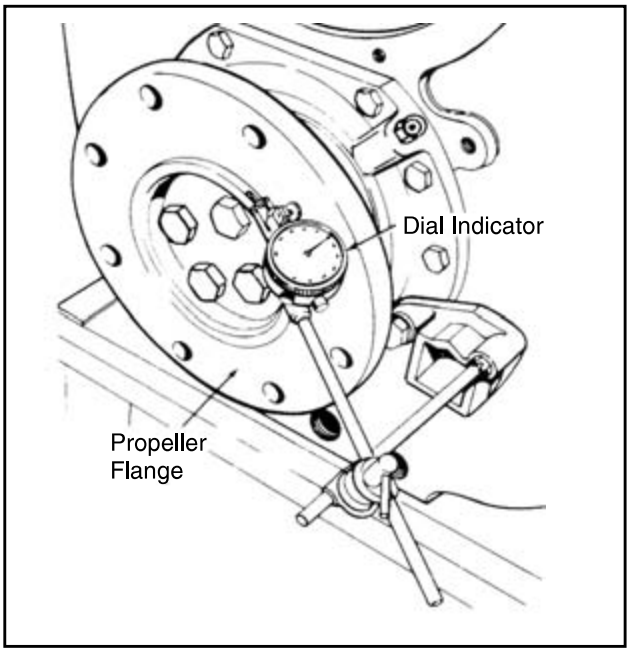
It will also be necessary to move the engine and transmission from one side or the other on the bed to obtain horizontal alignment. This can be done with a jack placed horizontally between the engine and the foundation. At the same time, a straight edge is laid across the edges of the flanges at the top and side to check the parallel alignment of the coupling edges.

Fig. 10-9 Checking output flange face runout.




fg-10

Fig. 10-10 Checking output flange pilot eccentricity.




fg-10

Some boats are not structurally rigid and some carry their load in such a way that they will “hog” or go out of normal shape with every loading and unloading. Where this condition exists, it may be necessary to make a compromise between the top and bottom coupling clearance by leaving a greater clearance at the bottom of the marine transmission output flange and propeller coupling. This clearance might be 0.13 mm (0.005 in) to 0.18 mm (0.007 in) while the top would maintain the standard 0.05 mm (0.002 in).

During the process of securing final alignment, it may be necessary to shift the engine many times. When it becomes apparent that the alignment is reasonably close, mark and drill the holes for the lag studs. Then with final alignment secured, make up the necessary steel or hardwood shims, and fasten the engine and transmission in place. Then recheck the alignment, and if satisfactory, bolt the coupling together.

There are many types of flexible couplings in the market today that solve a variety of problems, not just for noise and vibration. In some cases, the alignment of these couplings requires accuracy equal to that of rigid couplings. Some couplings are made to allow a permanent angular misalignment, while others allow engines to be flexibly mounted and take out the momentary misalignment. Always use the alignment procedures recommended by the coupling manufacturer.

**⚠ CAUTION**

**Be sure the transmission is filled with oil before starting. See Section 4 for proper oil and filling procedure.**

**⚠ WARNING**

**Transmission controls must be checked for proper function and alignment after any transmission service is performed. The selector valve must be properly indexed in relation to the operator's control lever. Failure to do so could cause control system malfunction, resulting in personal injury and or damage to equipment and property.**

For mechanical controls: Movement of the operator's selector lever to forward, neutral or reverse must position the transmission selector valve in the forward, neutral or reverse detent position.

Power operated controls: Selector valve positioning devices must be installed so that full travel of the actuating cylinder places the transmission selector valve in the detent position for forward or reverse, as selected, without exerting pressure on the rotational stop of the selector valve stem. Selecting neutral must place the selector valve in the neutral detent position. Improper installation of power engaging devices could cause failure of the selector valve rotational stop, permitting improper positioning of the selector valve and resulting in control malfunction.

**⚠ WARNING**

**See specific marine transmission installation drawings for detail and dimensional information needed for proper installation of power engaging devices.**

Section 11

# Special Tools

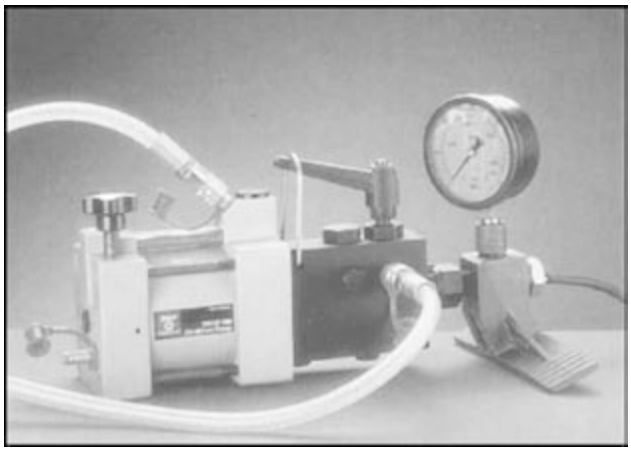
## 11.0 List of Special Tools


| | | |
|---|---|---|
| 11-2 | SKF Air-Driven Pump Set | THAP 300 |
| 11-3 | Bearing Driver | T-18050-96 |
| 11-4 | Bearing Cup Driver | T-18050-116 |
| 11-5 | Seal Driver | T-18050-120 |
| 11-6 | Bearing Seat Driver | T-18050-152 |
| 11-7 | Bearing Driver | T-18050-606 |
| 11-8 | Bearing Driver | T-18050-607 |
| 11-9 | Driver | T-18050-609 |
| 11-10 | Bearing Driver | T-18050-610/612 |
| 11-11 | Seal Driver (Sh. 1 of 2) | T-18050-696 |
| 11-12 | Seal Protector (Sh. 2 of 2) | T-18050-696 |
| 11-13 | Seal Sleeve | T-21347 |
| 11-14 | Seal Driver | T-21347-1 |
| 11-15 | Seal Driver | T-18050-722 |
| 11-16 | Output Shaft Seal Driver | T-18050-716 |
| 11-17 | Output Shaft and Gear Assembly Fixture (Sh. 1 of 2) | T-18196-6 |
| 11-18 | Output Shaft and Gear Assembly Fixture (Sh. 2 of 2) | T-18196-6 |
| 11-19 | Spring Retainer Hold Down | T-19998 |
| 11-20 | Output Gear and Shaft Puller (Sh. 1 of 4) | T-20023 |
| 11-21 | Output Gear and Shaft Puller (Sh. 2 of 4) | T-20023 |
| 11-22 | Output Gear and Shaft Puller (Sh. 3 of 4) | T-20023 |
| 11-23 | Output Gear and Shaft Puller (Sh. 4 of 4) | T-20023 |
| 11-24 | Output Gear to Shaft Puller (Sh. 1 of 2) | T-20023-2 |
| 11-25 | Output Gear to Shaft Puller (Sh. 2 of 2) | T-20023-2 |
| 11-26 | Sleeve for Runout Check | T-21302-1 |
| 11-27 | Output Flange Press Fixture | T-21397 |
| 11-28 | Lifting Bracket for Clutch Removal in Boat | No P/N |
| 11-29 | Output Gear Lifting Fixture | T-19987 |

## Twin Disc recommends the following products for use in the assembly and removal of tapered shafts using the oil injection method:

### THAP 300 Air-Driven Pump Set

This set consists of the air-driven pump with accessories, such as an adapter block, pressure gauge, high pressure pipe, or pressure hose with quick connection couplings and connection nipples. The set includes one of each: air-driven pump [THAP 300], adapter block [226402], pressure gauge [1077589] and high pressure pipe (2m/6.5 ft.) [227957A].

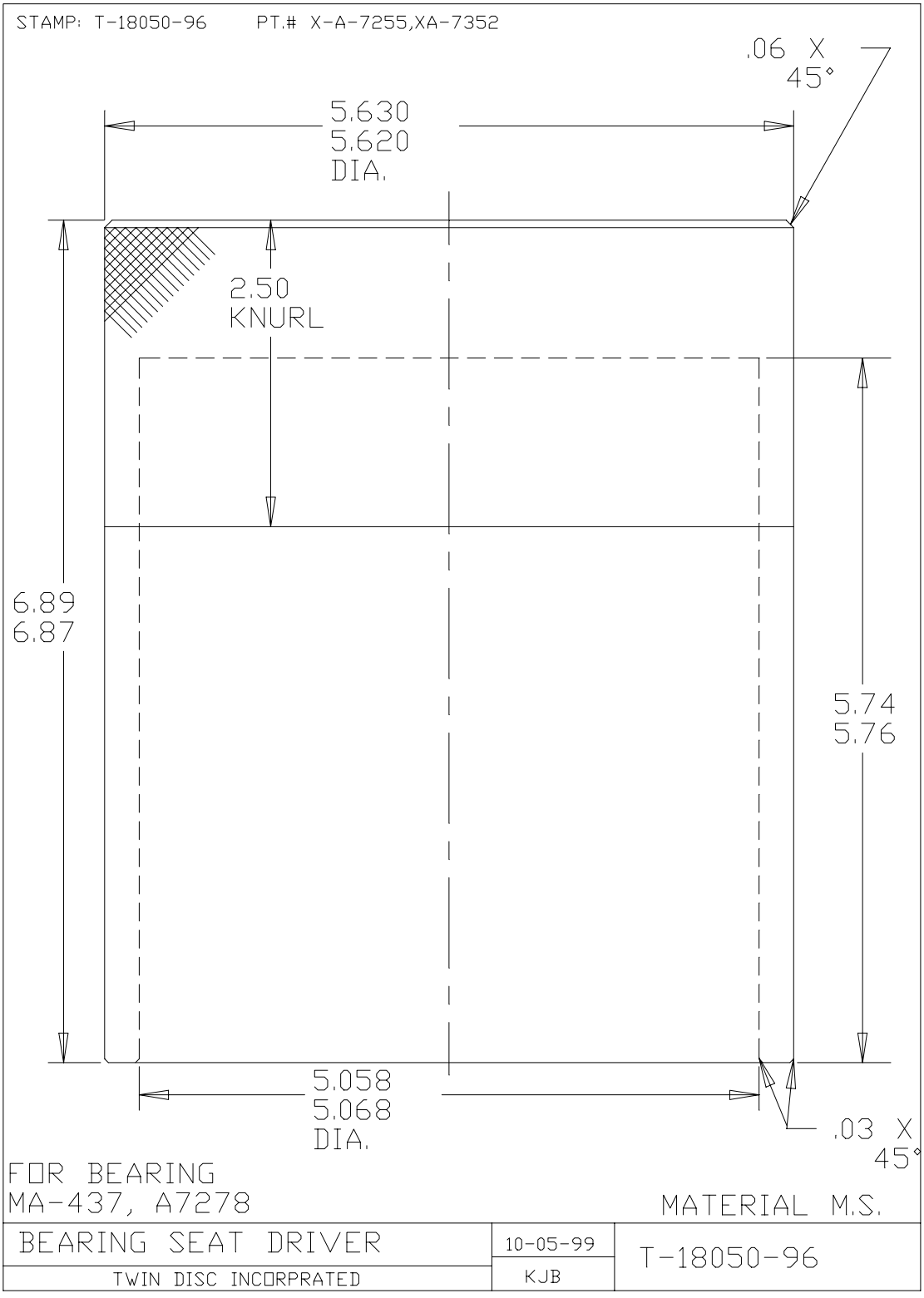


### Mounting Fluid LHMF 300 and Dismounting Fluid LHDF 900

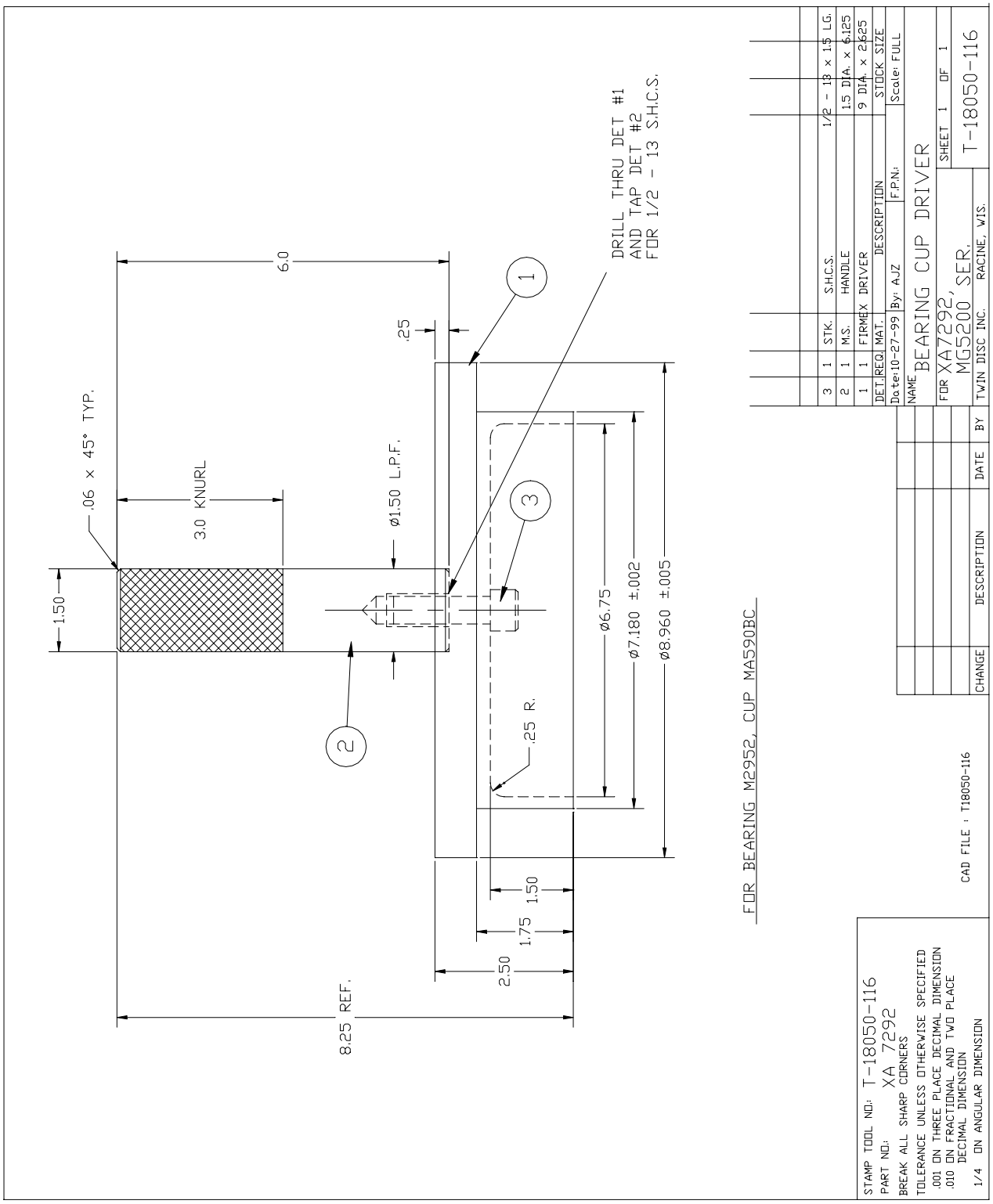
SKF LHMF 300 and LHDF 900 are recommended when using SKF hydraulic equipment like hydraulic pumps. HMV nuts, oil injection equipment, etc. The fluids contain anticorrosives and are non-aggressive to seal material like nitrile rubber, Buna N (Perbunan), chrome, leather, PTFE, etc. SKF LHMF 300 and LHDF 900 are available in 5 liter (5.3 qt.) cans. Designation: LHMF 300/5 and LHDF 900/6.

**Order through your local authorized SKF distributor.**

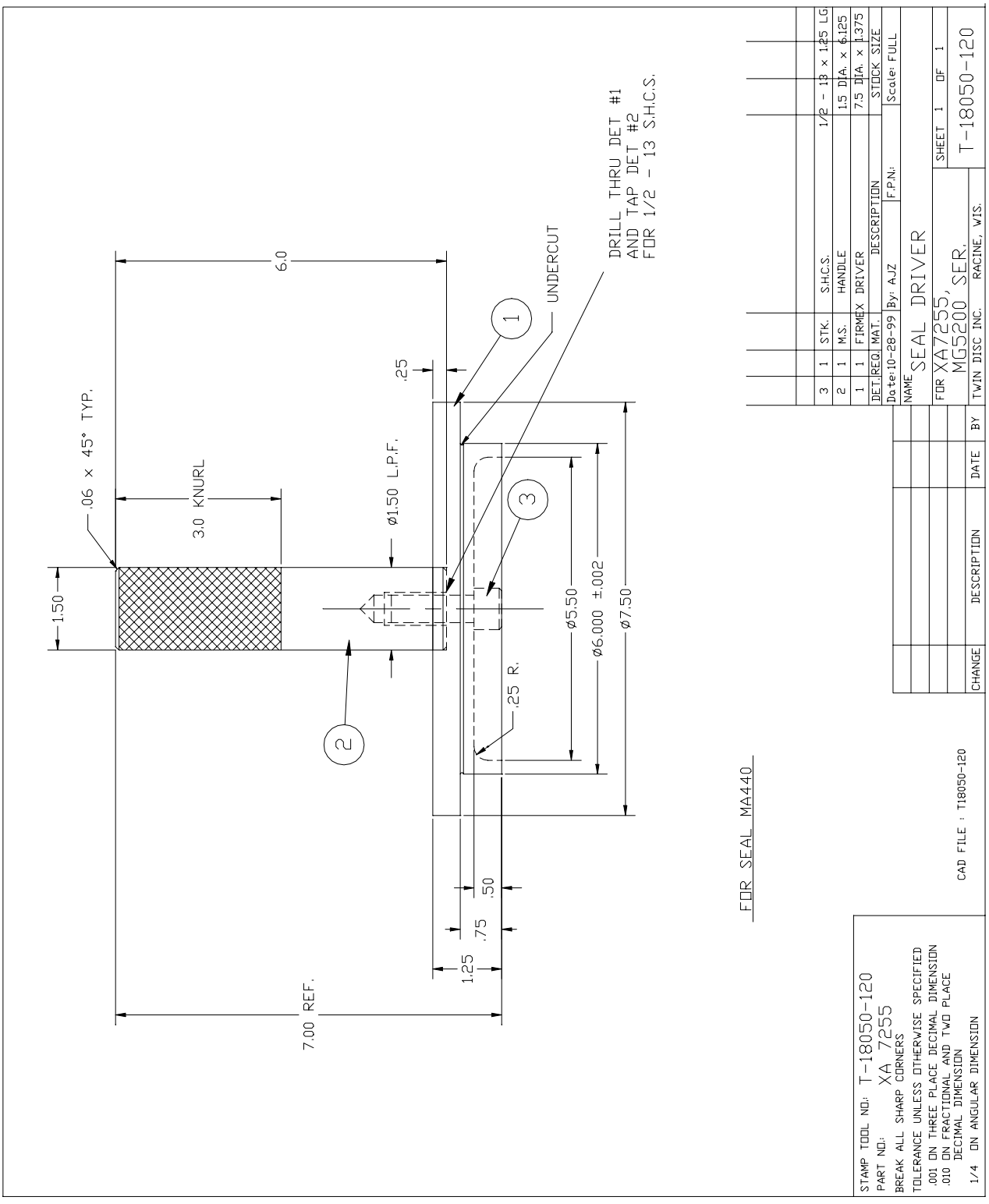
## 11-3 Driver T-18050-96



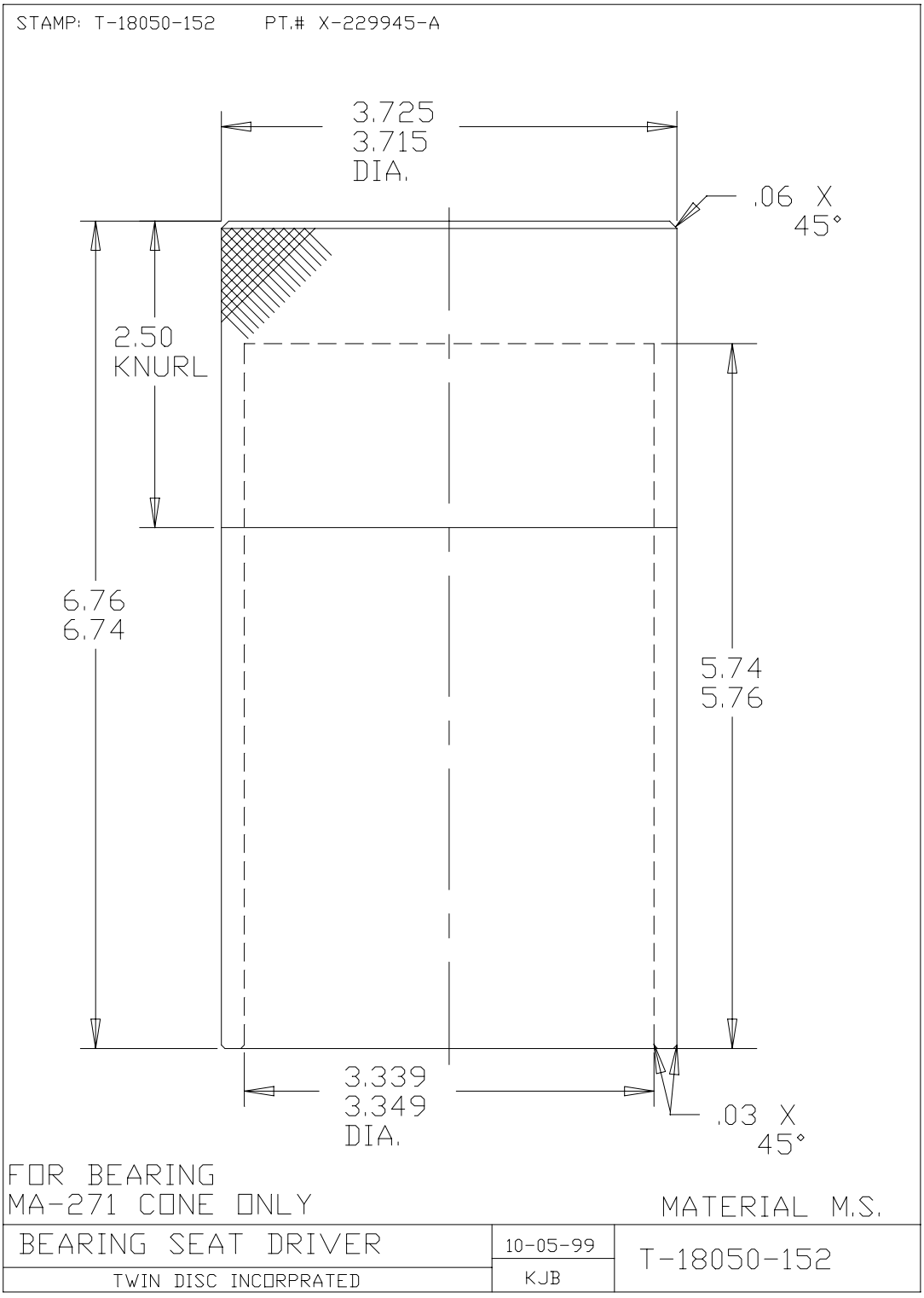
# 11-4 Bearing Cup Driver T-18050-116



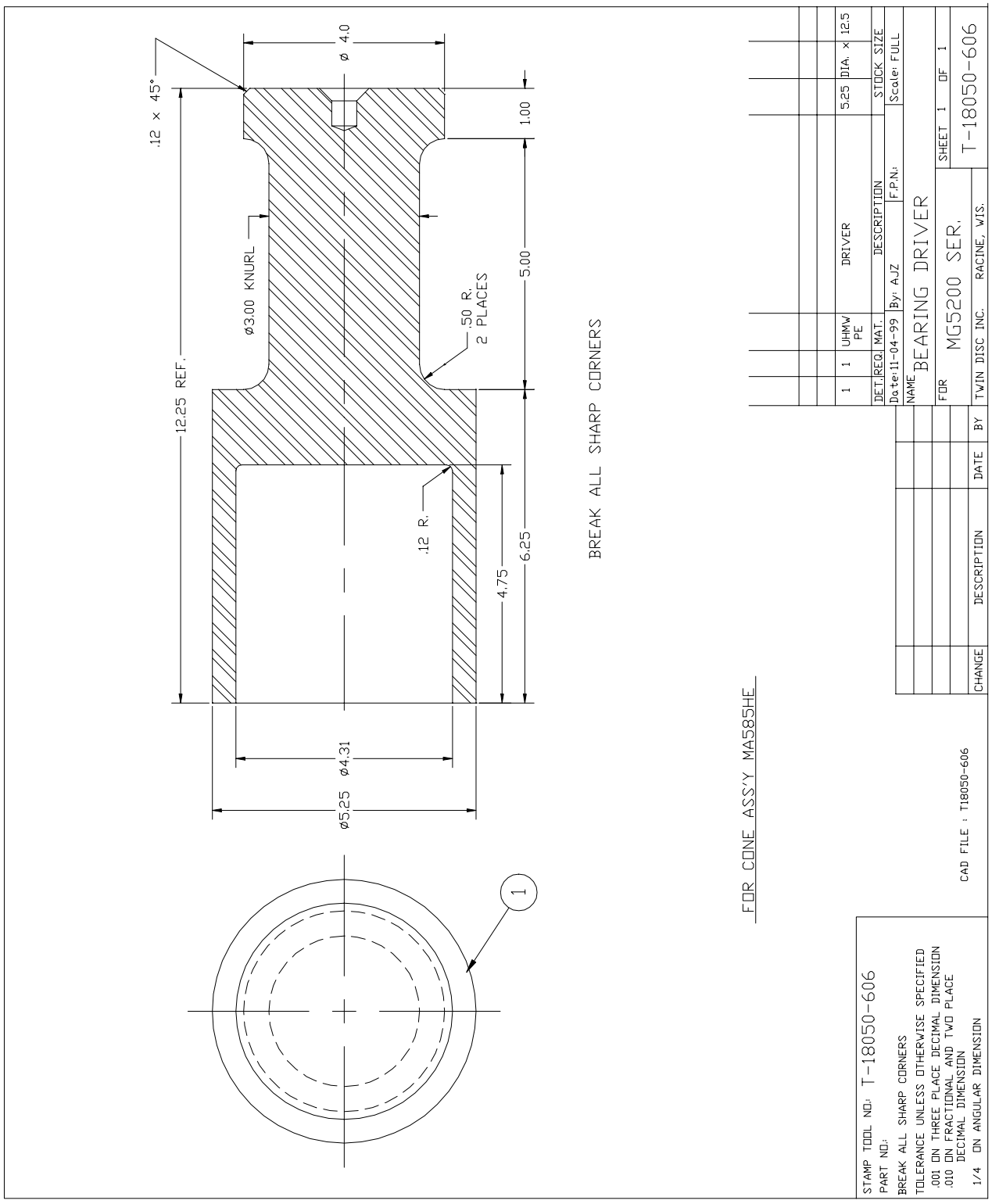
## 11-5 Seal Driver T-18050-120



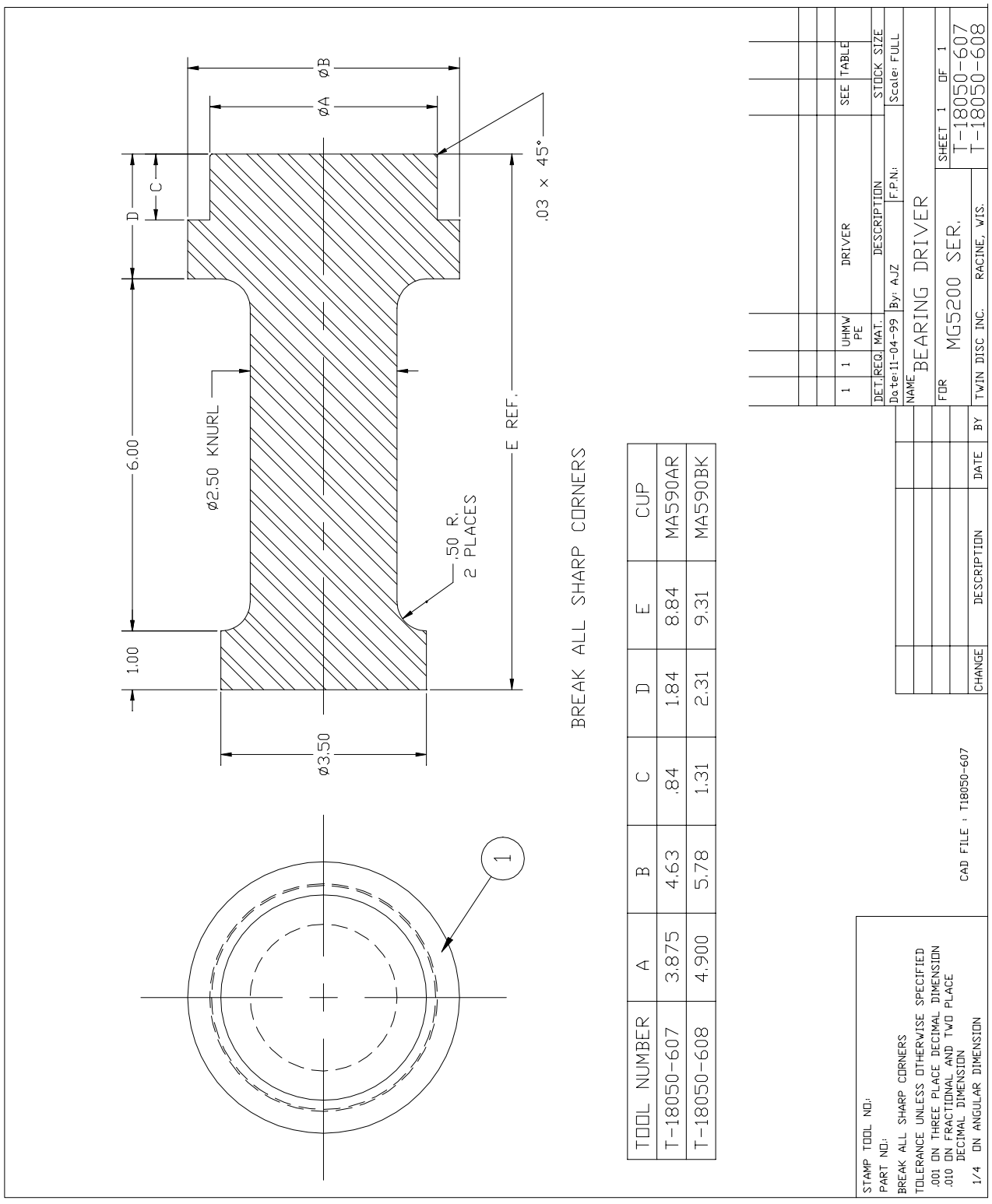
## 11-6 Bearing Seat Driver T-18050-152



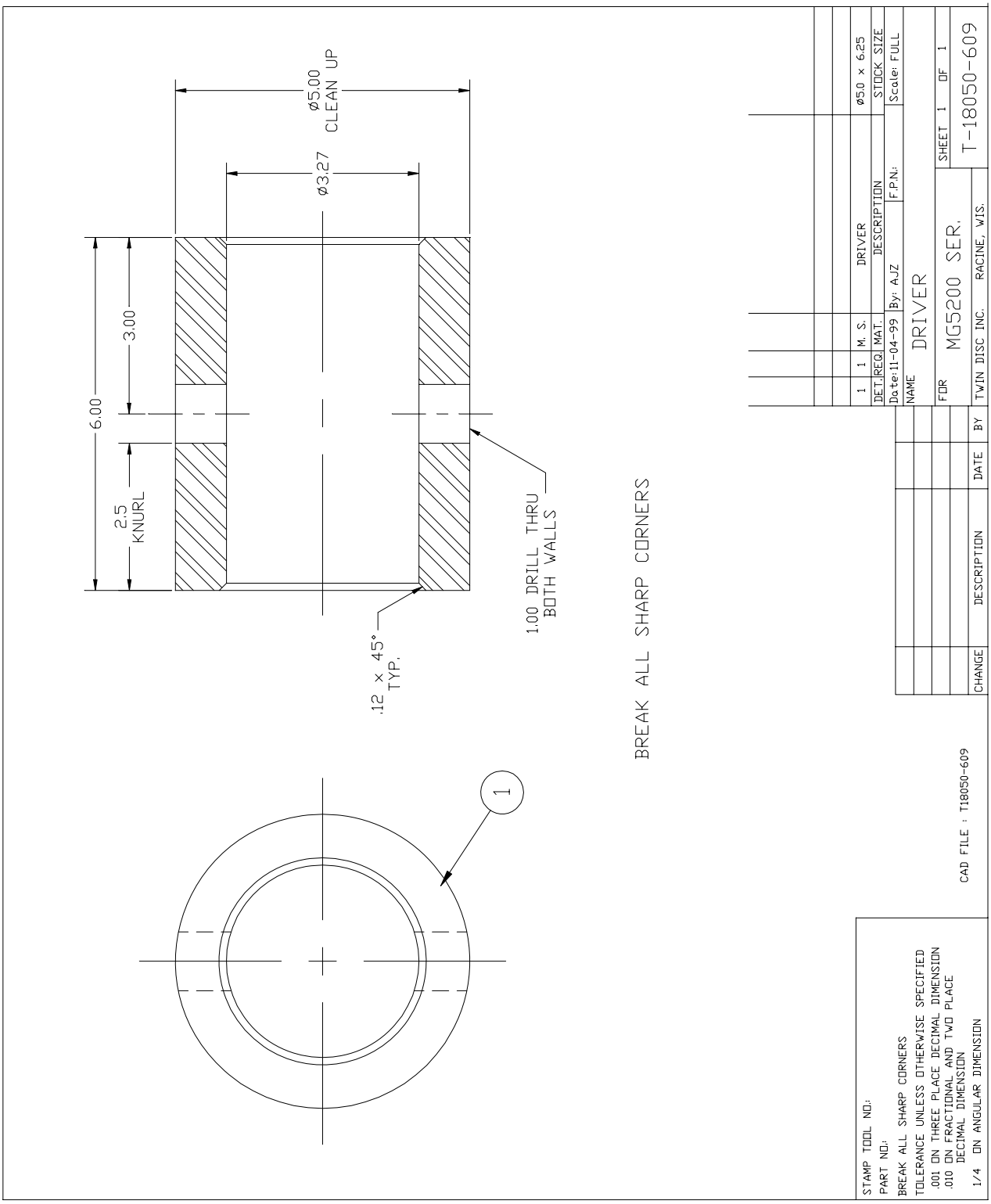
## 11-7 Bearing Driver T-18050-606



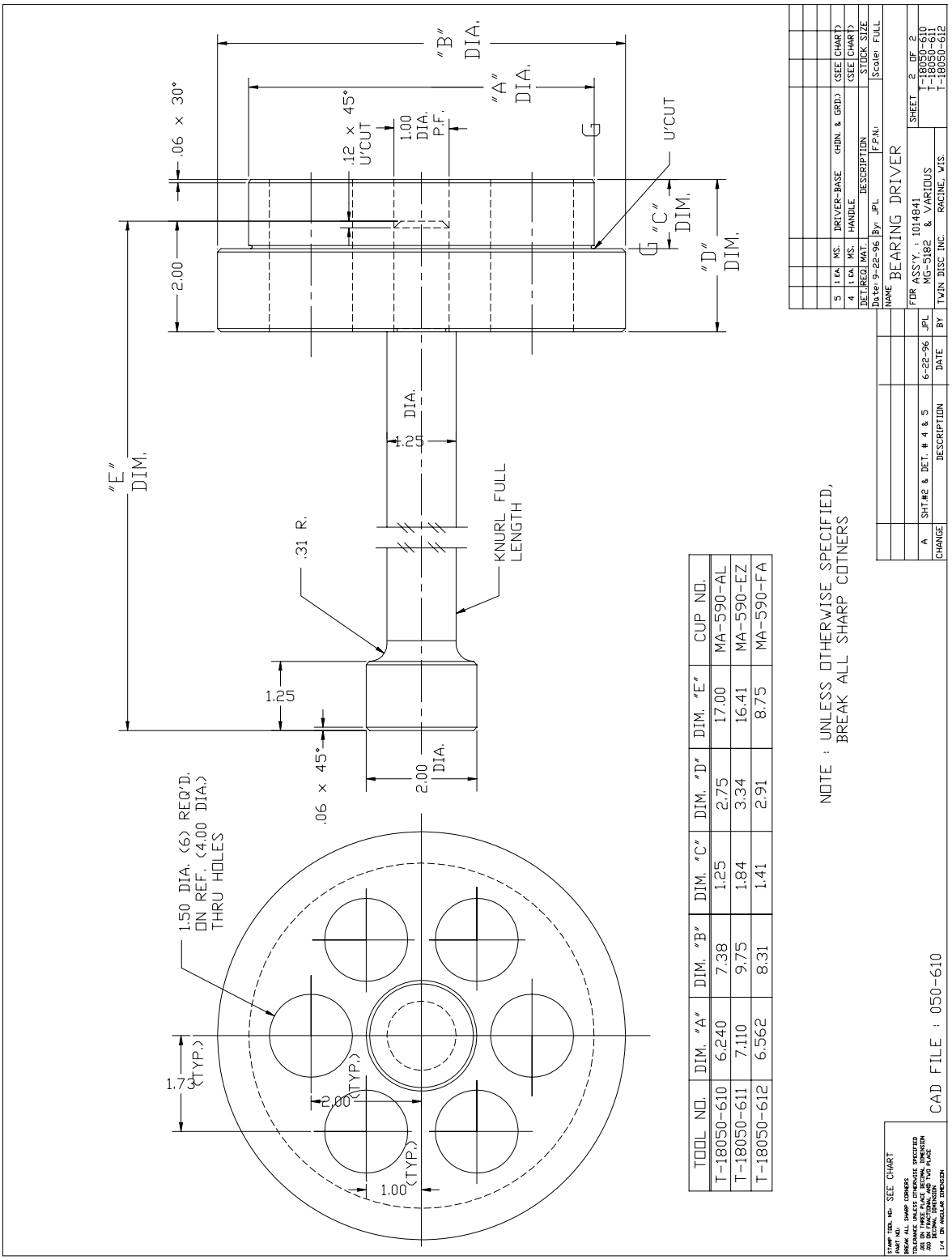
# 11-8 Bearing Driver T-18050-607


ØB
ØA
C
D
.03 x 45°
6.00
Ø2.50 KNURL
E REF.
.50 R.
2 PLACES
1.00
Ø3.50
1
BREAK ALL SHARP CORNERS
TOOL NUMBER | A | B | C | D | E | CUP
T-18050-607 | 3.875 | 4.63 | .84 | 1.84 | 8.84 | MA590AR
T-18050-608 | 4.900 | 5.78 | 1.31 | 2.31 | 9.31 | MA590BK
STAMP TOOL NO.:
PART NO.:
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.001 ON THREE PLACE DECIMAL DIMENSION
.010 ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION
CAD FILE : T18050-607
CHANGE | DESCRIPTION | DATE | BY
1 1 UHMW PE DRIVER SEE TABLE
DET.REQ. MAT. DESCRIPTION STOCK SIZE
Date:11-04-99 By: AJZ F.P.N.: Scale: FULL
NAME BEARING DRIVER
FOR MG5200 SER, TWIN DISC INC. RACINE, WIS.
SHEET 1 OF 1
T-18050-607
T-18050-608

## 11-9 Driver T-18050-609

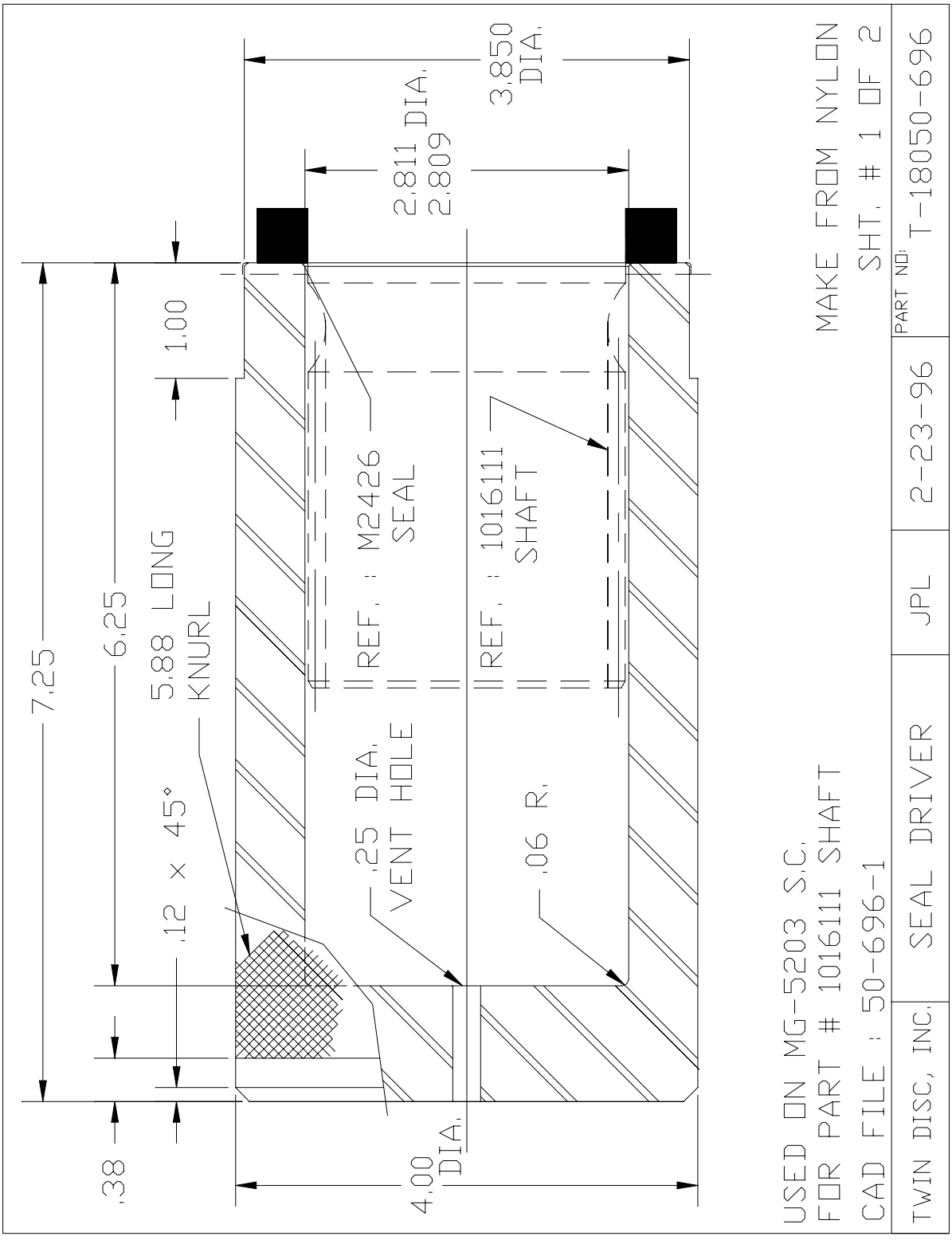


# 11-10 Bearing Driver T-18050-610/612

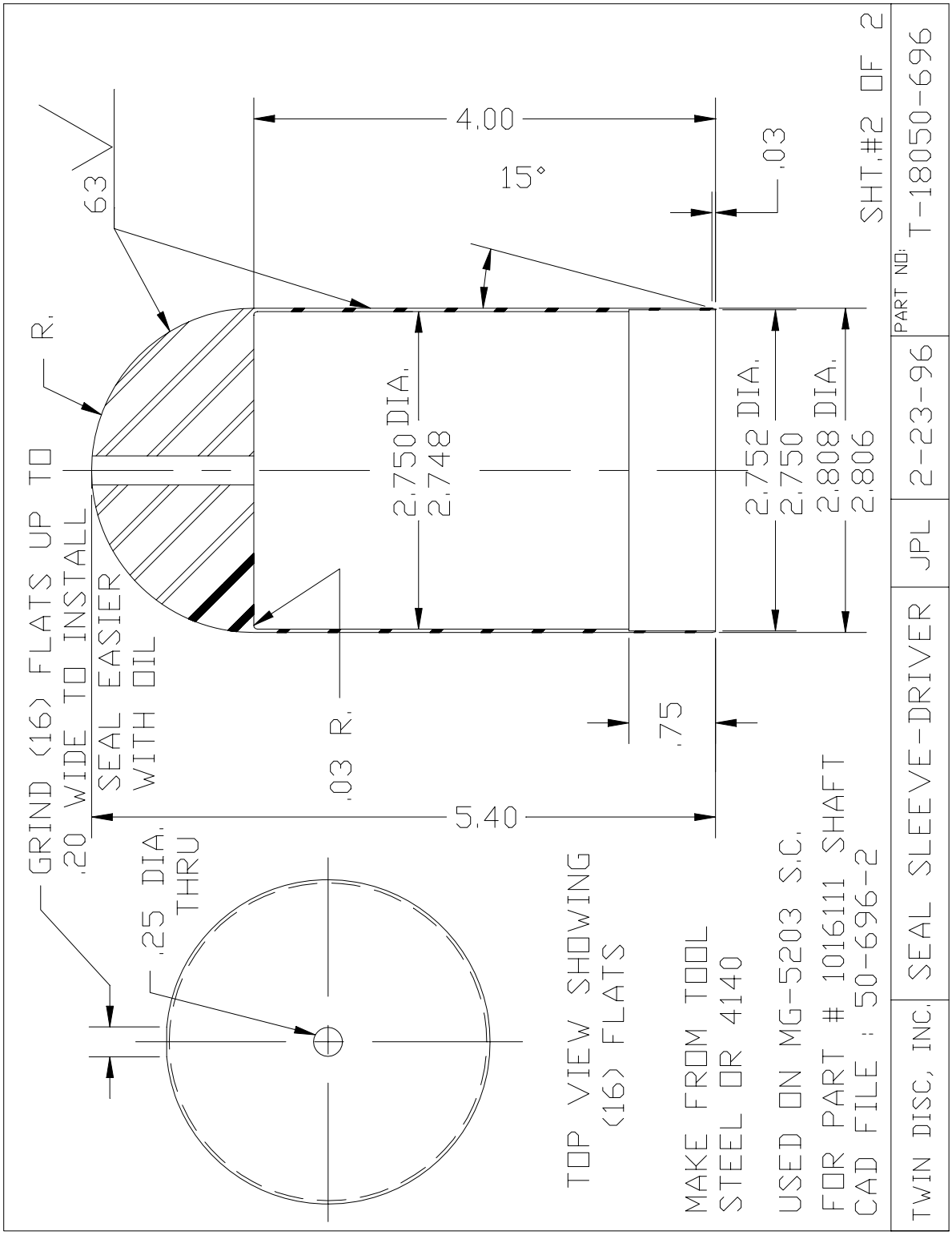



| TOOL NO. | DIM. "A" | DIM. "B" | DIM. "C" | DIM. "D" | DIM. "E" | CUP NO. |
|---|---|---|---|---|---|---|
| T-18050-610 | 6.240 | 7.38 | 1.25 | 2.75 | 17.00 | MA-590-AL |
| T-18050-611 | 7.110 | 9.75 | 1.84 | 3.34 | 16.41 | MA-590-EZ |
| T-18050-612 | 6.562 | 8.31 | 1.41 | 2.91 | 8.75 | MA-590-FA |

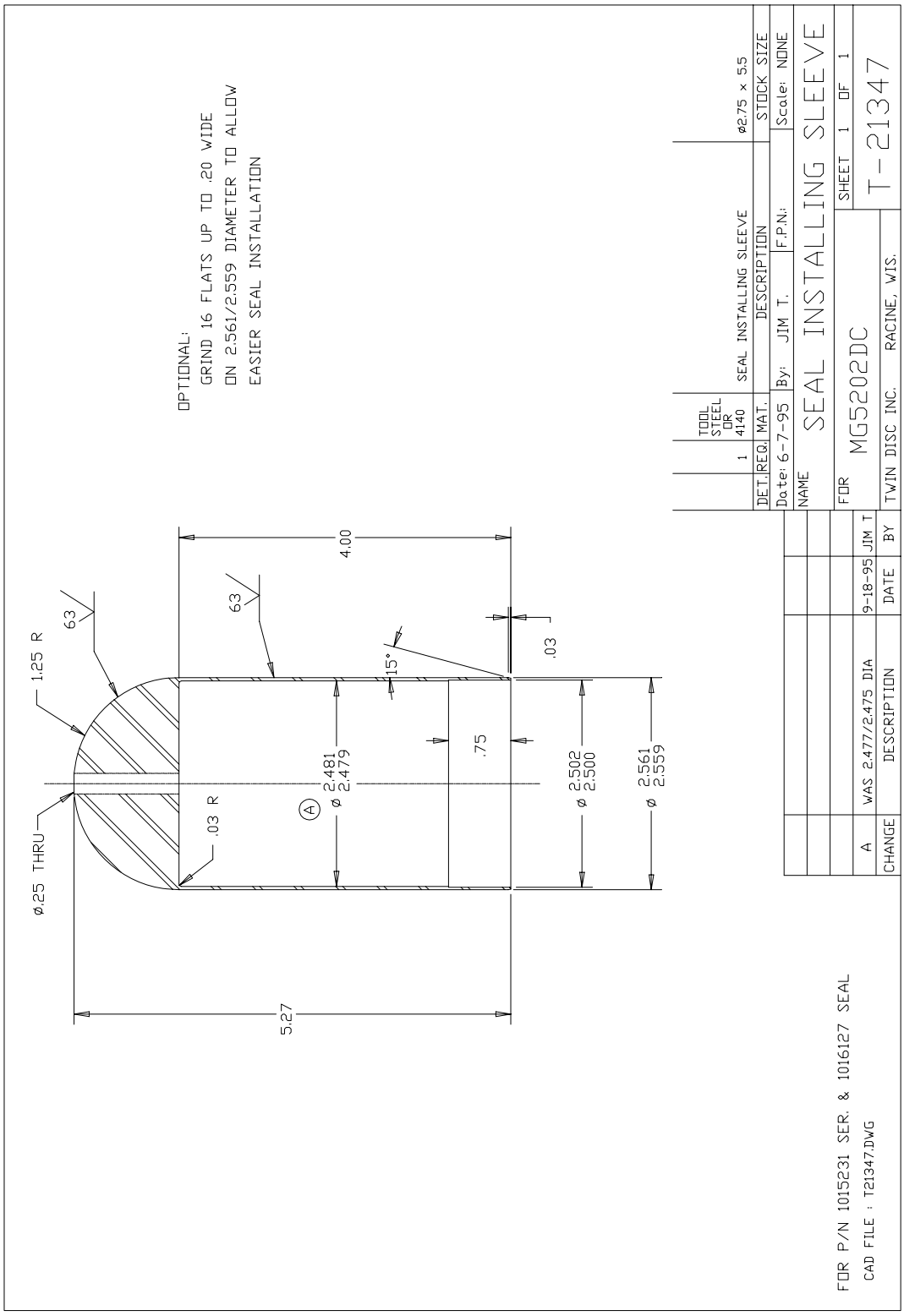
## 11-11 Seal Driver T-18050-696 - Sh. 1 of 2



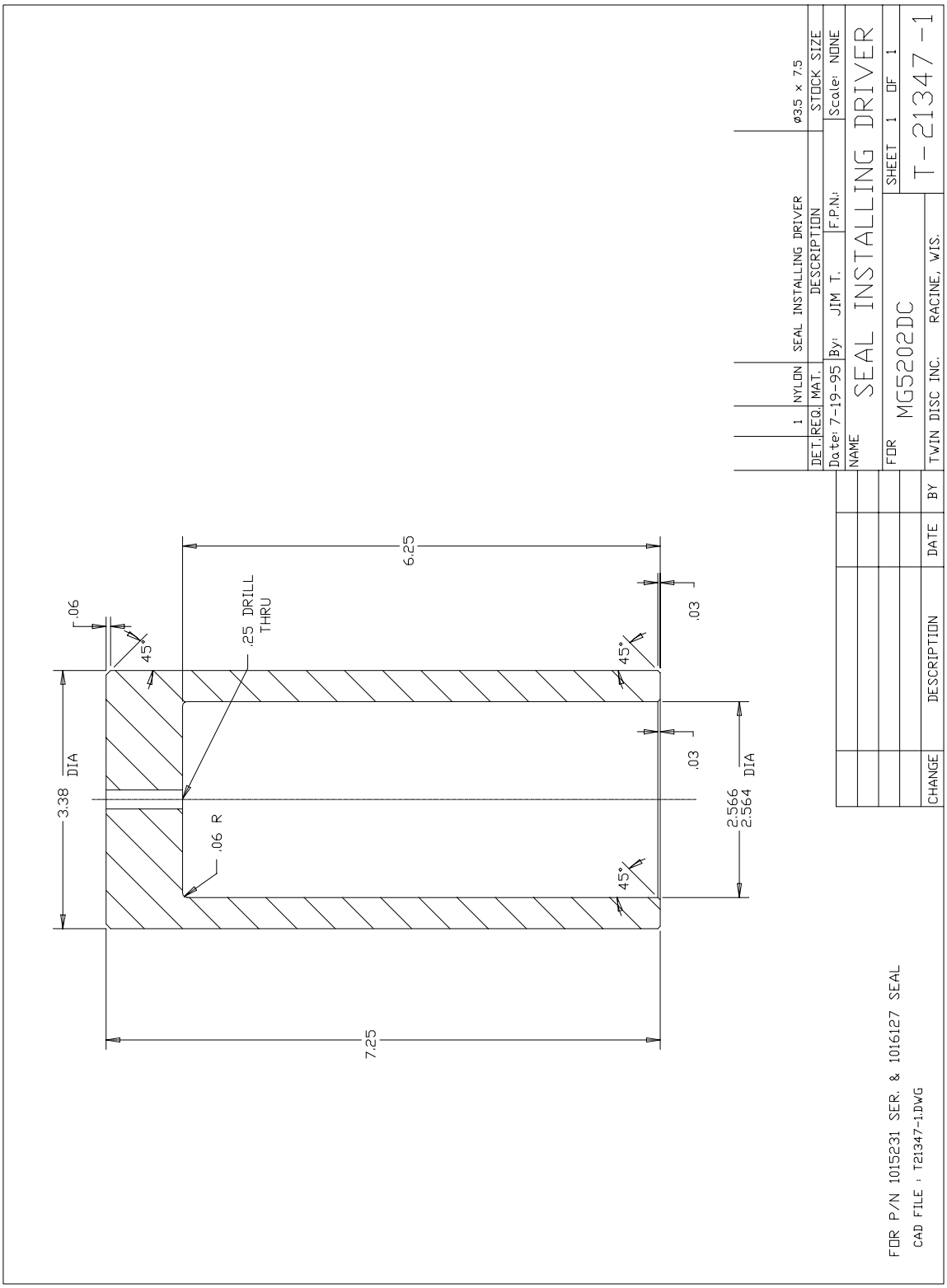
## 11-12 Seal Protector T-18050-696 - Sh. 2 of 2



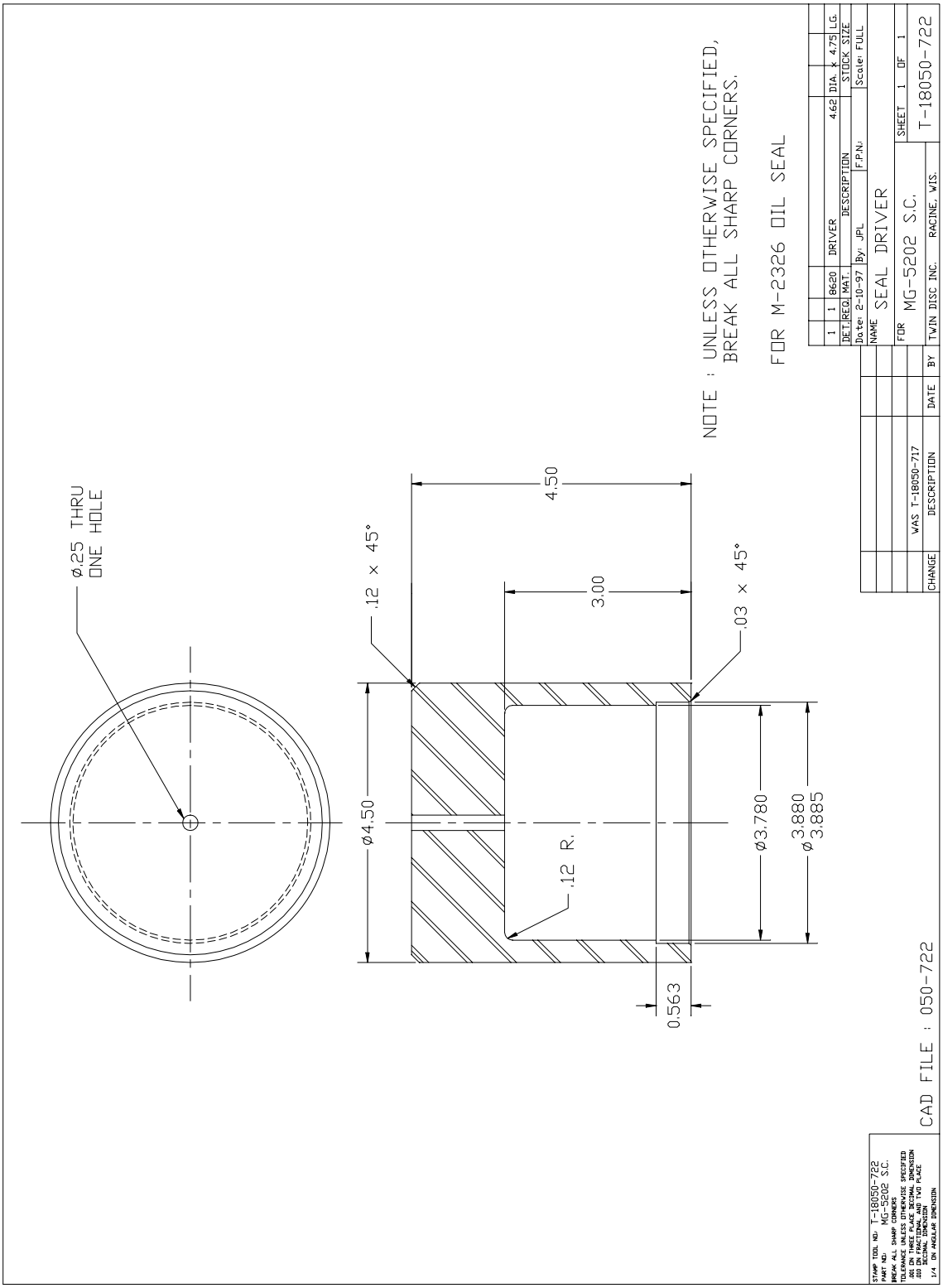
## 11-13 Seal Sleeve T-21347



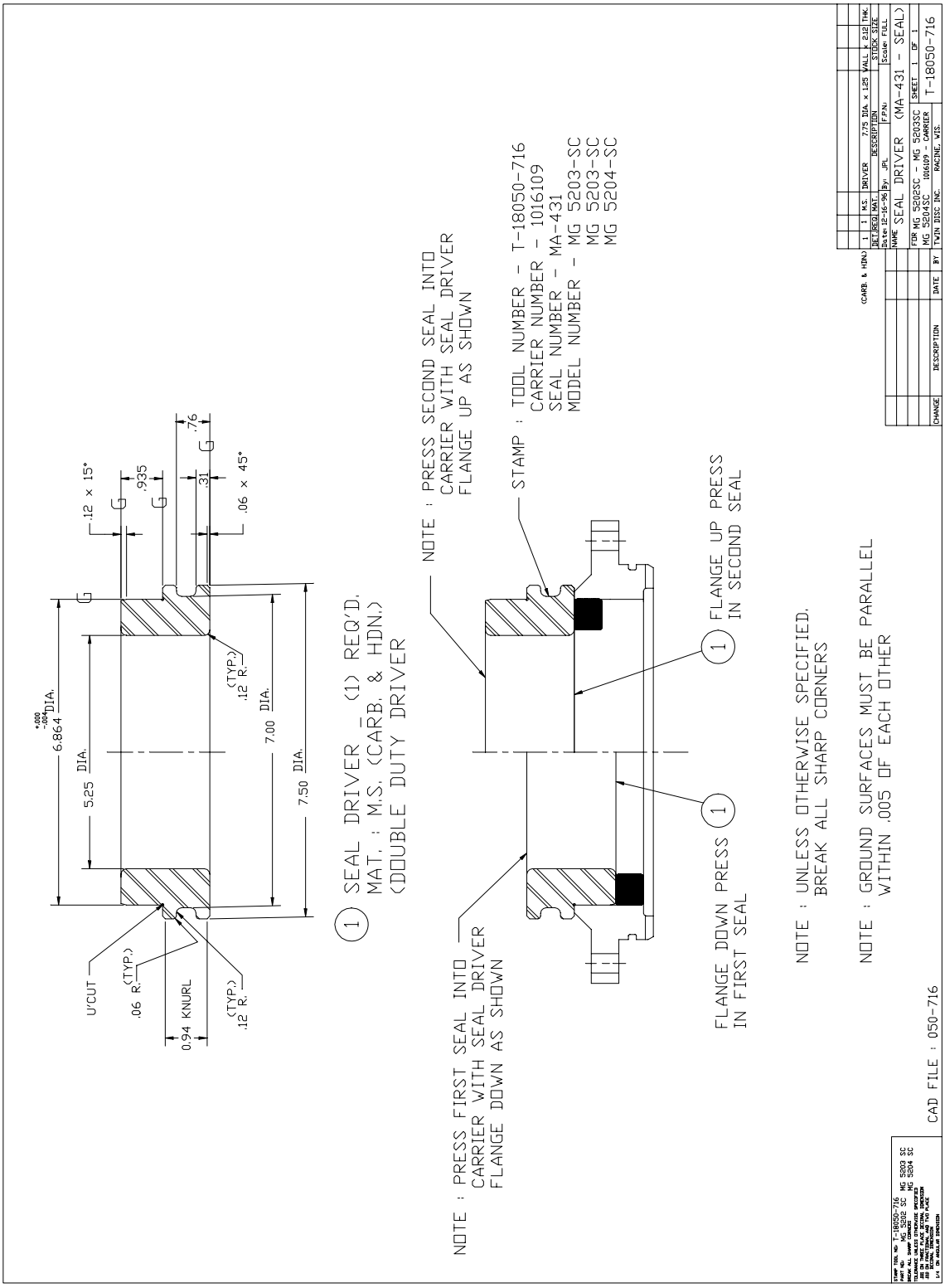
## 11-14 Seal Driver T-21347-1



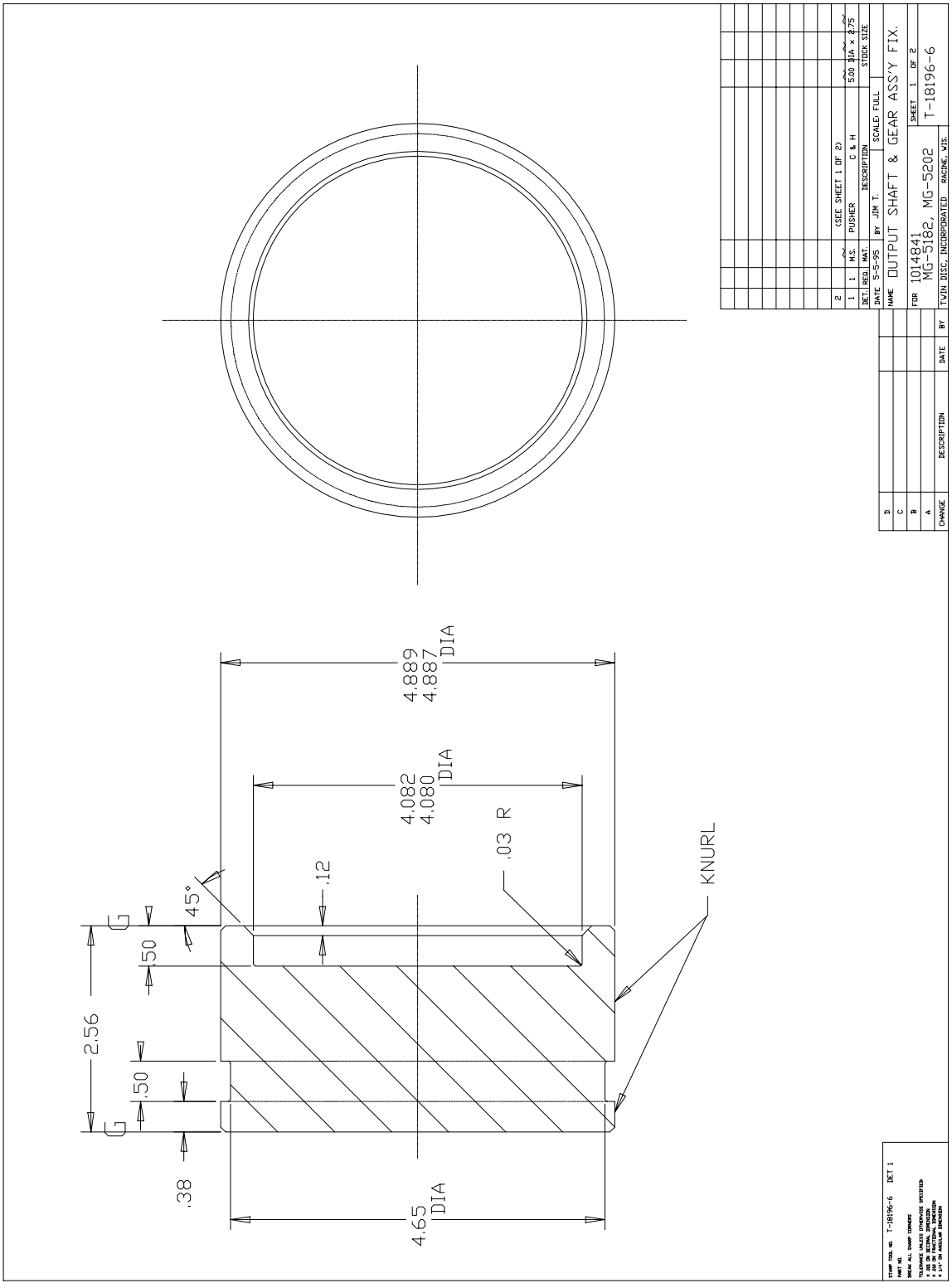
## 11-15 Seal Driver T-18050-722



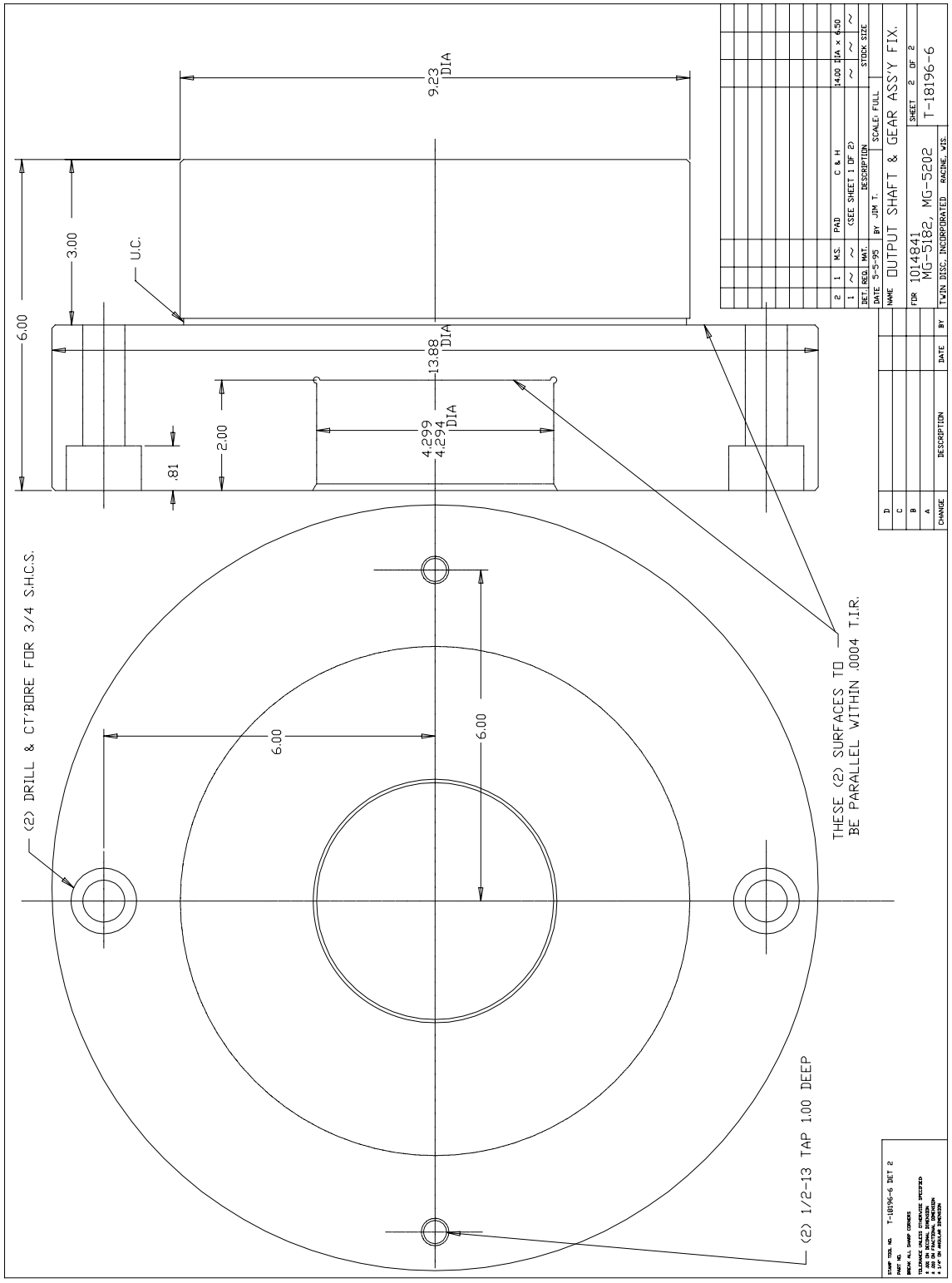
# 11-16 Output Shaft Seal Driver T-18050-716


1 SEAL DRIVER (1) REQ'D.
MAT. : M.S. (CARB. & HDN.)
(DOUBLE DUTY DRIVER
NOTE : PRESS SECOND SEAL INTO CARRIER WITH SEAL DRIVER FLANGE UP AS SHOWN
STAMP : TOOL NUMBER - T-18050-716
CARRIER NUMBER - 1016109
SEAL NUMBER - MA-431
MODEL NUMBER - MG 5203-SC
MG 5203-SC
MG 5204-SC
NOTE : PRESS FIRST SEAL INTO CARRIER WITH SEAL DRIVER FLANGE DOWN AS SHOWN
FLANGE DOWN PRESS (1) IN FIRST SEAL
FLANGE UP PRESS (1) IN SECOND SEAL
NOTE : UNLESS OTHERWISE SPECIFIED, BREAK ALL SHARP CORNERS
NOTE : GROUND SURFACES MUST BE PARALLEL WITHIN .005 OF EACH OTHER
CAD FILE : 050-716
U'CUT
.06 R. (TYP.)
0.94 KNURL
.12 R. (TYP.)
.12 R. (TYP.)
.12 x 15°
.935
.76
.31
.06 x 45°
6.864 +.000 -.004 DIA.
5.25 DIA.
7.00 DIA.
7.50 DIA.
(CARB. & HDN.)
SEAL DRIVER (MA-431 - SEAL)
T-18050-716
MG 5202-SC - MG 5203SC
MG 5204SC
TWIN DISC INC. RACINE, WIS.

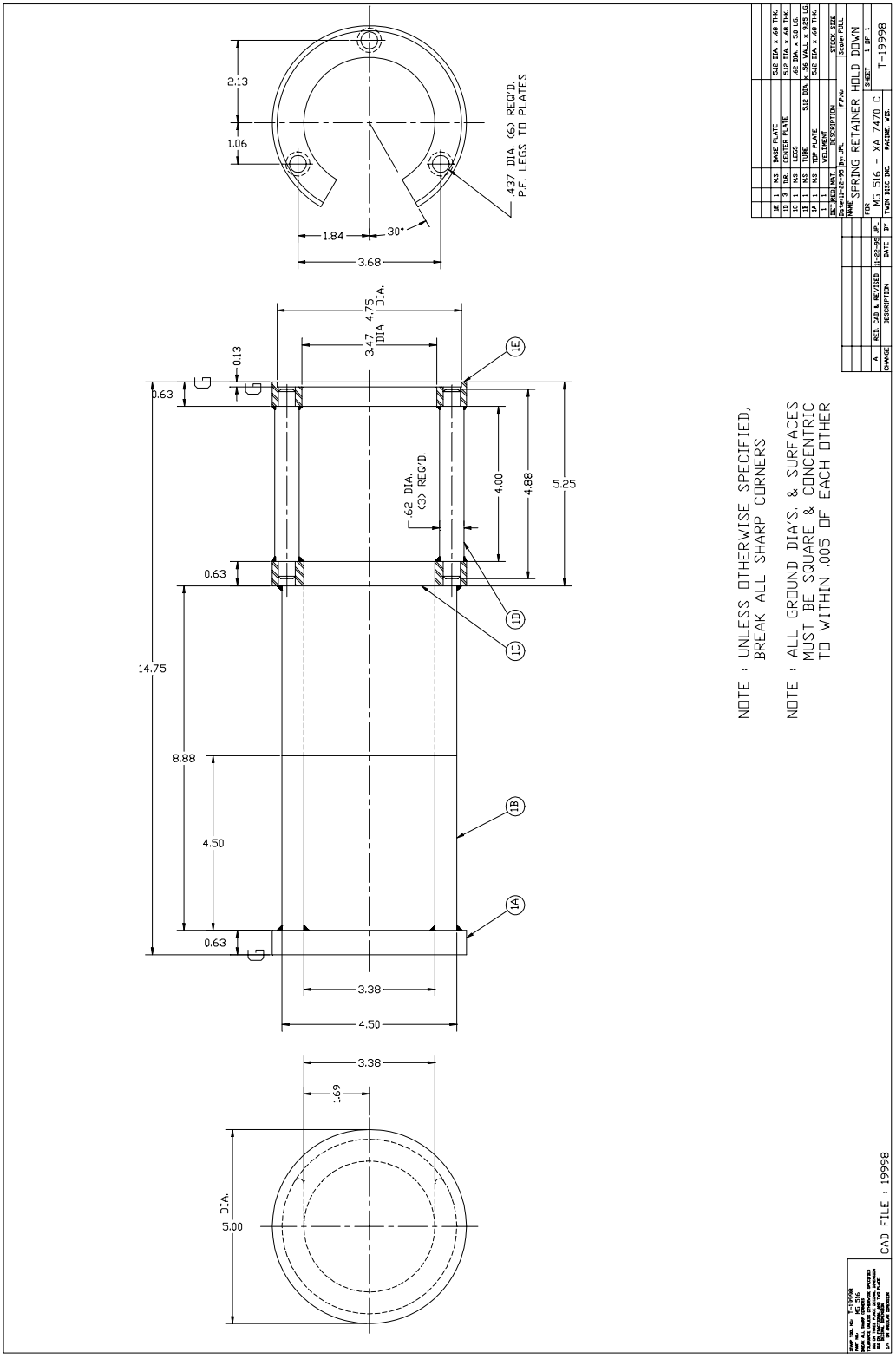
# 11-17 Output Shaft & Gear Assembly Fixture T-18196-6 - Sh. 1 of 2



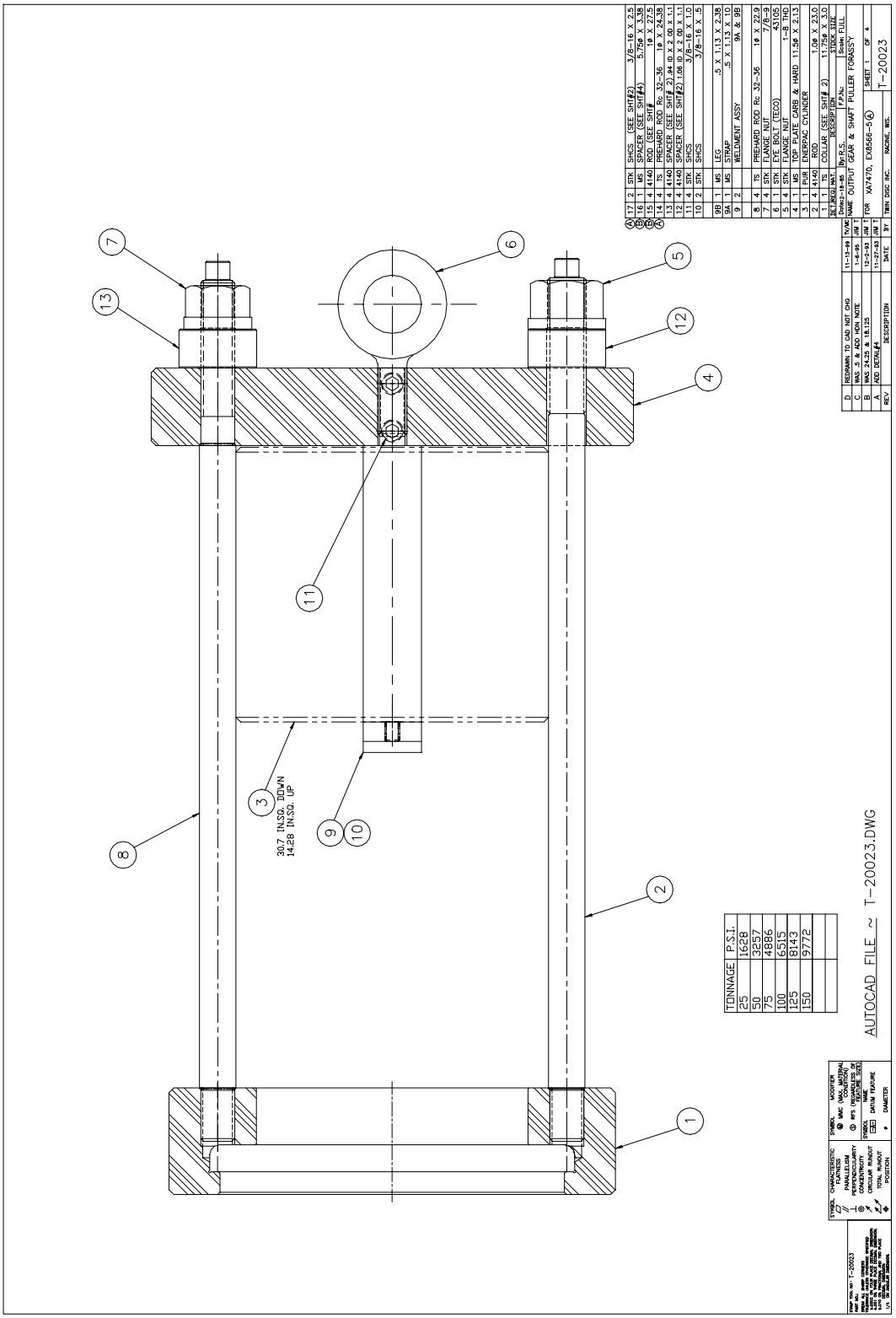
# 11-18 Output Shaft and Gear Assembly Fixture T-18196-6 - Sh. 2 of 2



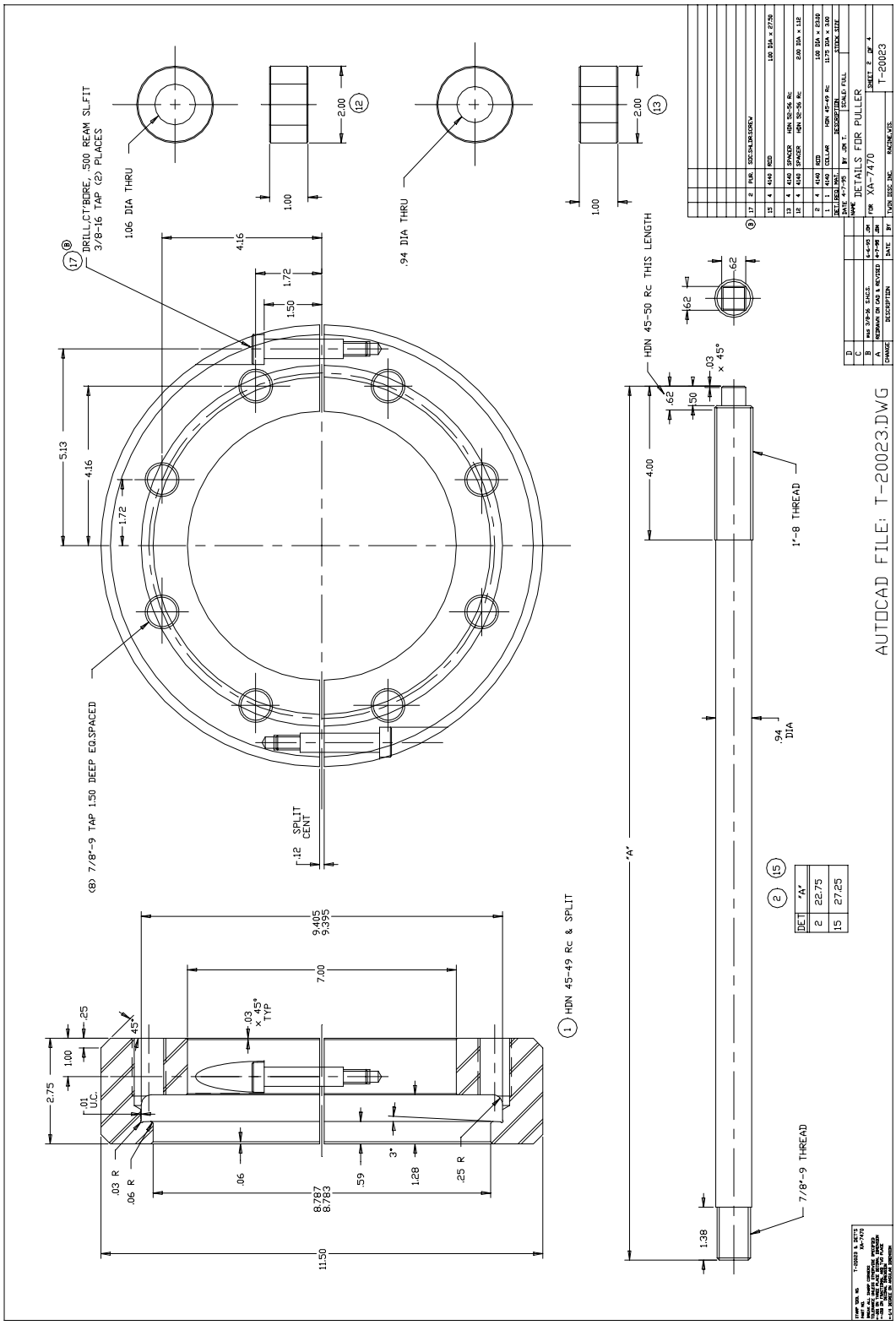
# 11-19 Spring Retainer Hold Down T-19998



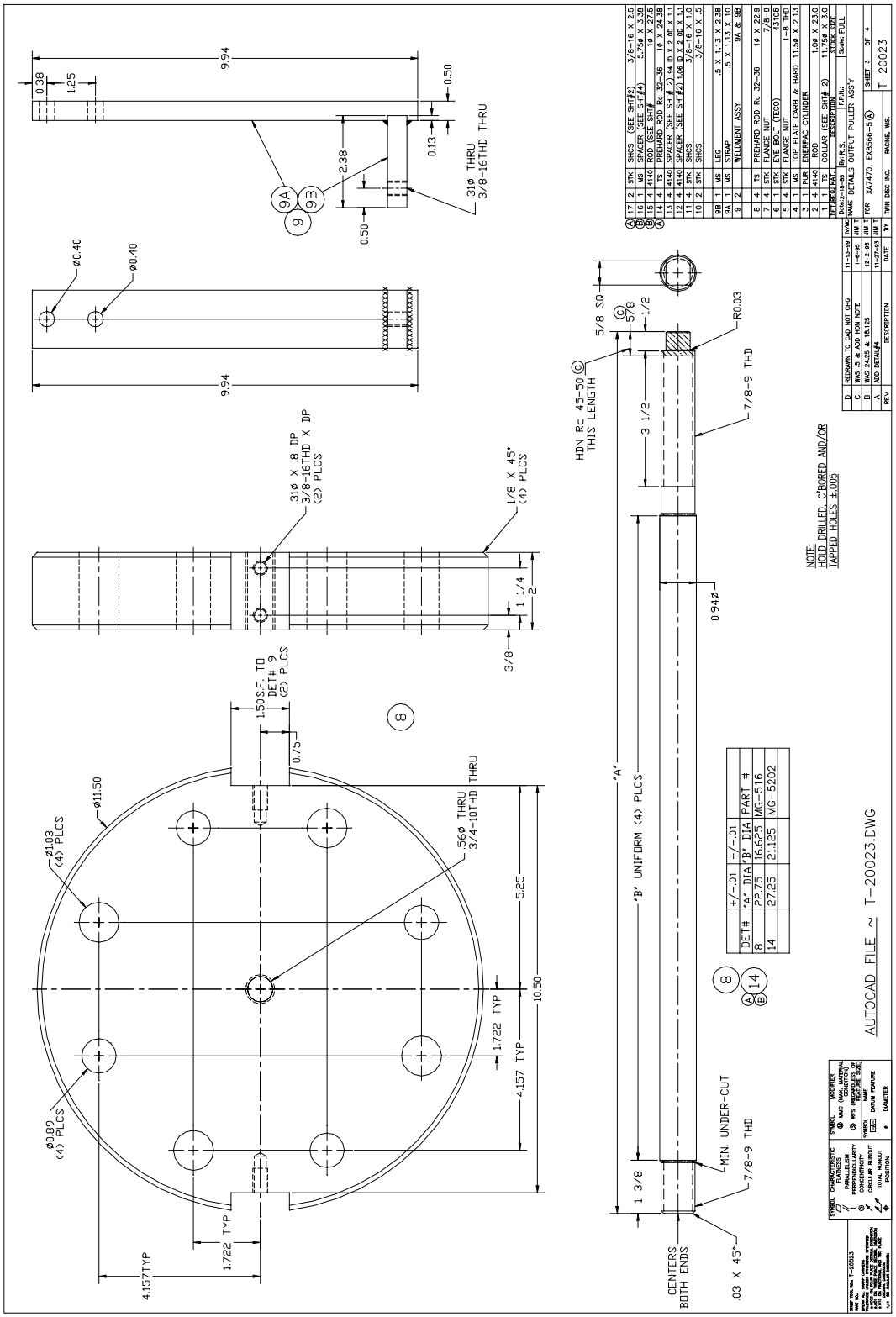
# 11-20 Output Gear & Shaft Puller for Assembly T-20023 - Sh. 1 of 4



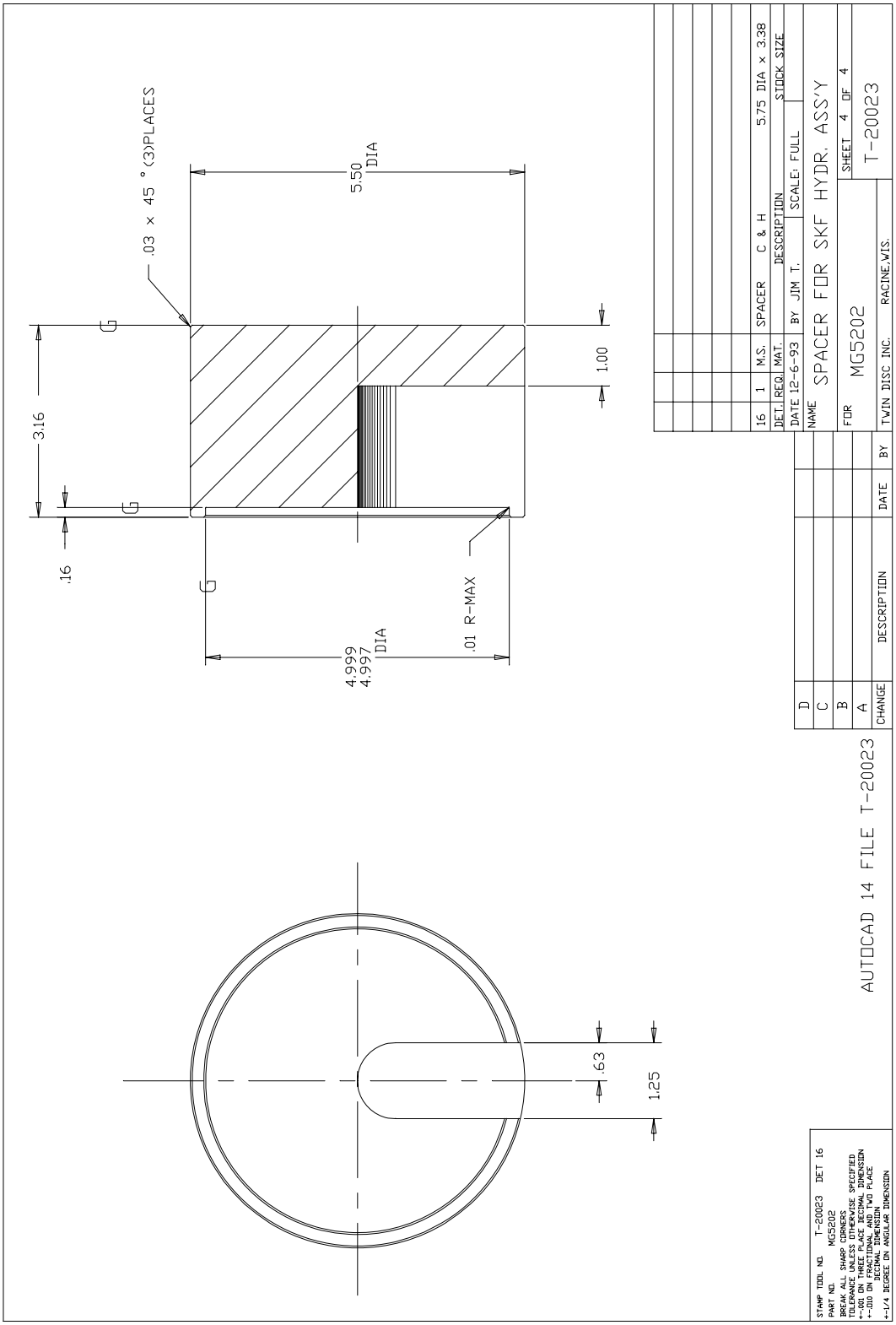
# 11-21 Details for Puller T-20023 - Sh. 2 of 4



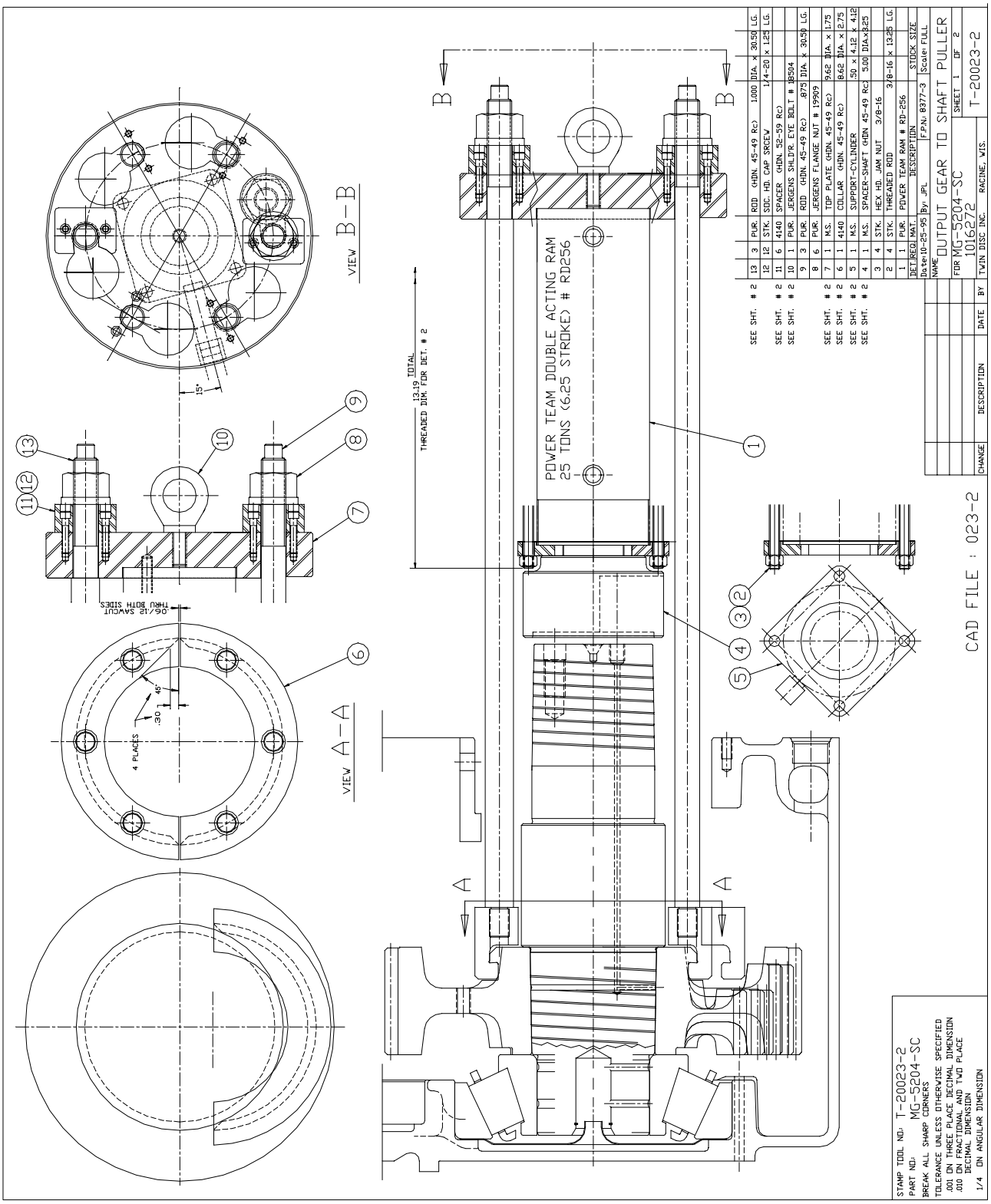
# 11-22 Details for Puller T-20023 - Sh. 3 of 4


AUTOCAD FILE ~ T-20023.DWG
'A'
'B' UNIFORM (4) PLCS
MIN. UNDER-CUT
7/8-9 THD
CENTERS BOTH ENDS
.03 X 45°
HDN Rc 45-50 THIS LENGTH
5/8 SQ
R0.03
3 1/2
0.94ø
NOTE: HOLD DRILLED, C'BORED AND/OR TAPPED HOLES ±.005
9.94
0.38
1.25
0.50
0.13
2.38
.31ø THRU 3/8-16THD THRU
ø0.40
.31ø X .8 DP 3/8-16THD X DP (2) PLCS
1/8 X 45° (4) PLCS
1 1/4
2
3/8
1.50 S.F. TO DET# 9 (2) PLCS
0.75
ø11.50
ø1.03 (4) PLCS
56ø THRU 3/4-10THD THRU
5.25
10.50
1.722 TYP
4.157 TYP
ø0.89 (4) PLCS
4.157TYP
DET# | +/-.01 'A' DIA | +/-.01 'B' DIA | PART #
8 | 22.75 | 16.625 | MG-516
14 | 27.25 | 21.125 | MG-5202
SYMBOL CHARACTERISTIC ACCESS
PARALLELISM
PERPENDICULARITY (SQUARENESS)
CIRCULAR RUNOUT
TOTAL RUNOUT
POSITION
SYMBOL MODIFIER
M MMC (MAXIMUM MATERIAL CONDITION)
S RFS (REGARDLESS OF FEATURE SIZE)
SYMBOL DATUM FEATURE
DIAMETER
REV DESCRIPTION DATE BY
D REDRAWN TO CAD NOT CHG 11-13-99 TV/MC
C WAS .5 & ADD NON NOTE 1-4-95 JJM T
B WAS 24.25 & 16.125 12-2-93 JJM T
A ADD DETAIL#4 11-27-93 JJM T
FOR XA7470, EX8566-S(A) SHEET 3 OF 4
T-20023
TWIN DISC INC. RACINE, WIS.
DELBERG MAT. Dwg#2-14-80 By:R.S. STOCK SIZE
NAME DETAILS OUTPUT PULLER ASSY 3mmm FULL
17 2 STK SHCS (SEE SHT#2) 3/8-16 X 2.5
16 4 MS SPACER (SEE SHT#4) 0.756 X .38
15 4 4140 ROD (SEE SHT#4) 1 1/4 X 22.5
14 4 TS PREHARD ROD Rc 32-36 1ø X 24.38
13 4 4140 SPACER (SEE SHT# 2) .94 ID X 2 OD X 1.1
12 4 4140 SPACER (SEE SHT#2) 1.06 ID X 2 OD X 1.1
11 4 STK SHCS 3/8-16 X 1.0
10 2 STK SHCS 3/8-16 X .5
9B 1 MS LEG .5 X 1.13 X 2.38
9A 1 MS STRAP .5 X 1.13 X 10
9 2 WELDMENT ASSY 9A & 9B
8 4 TS PREHARD ROD Rc 32-36 1ø X 22.9
7 4 STK FLANGE NUT 7/8-9
6 1 STK EYE BOLT (TEICO) 43105
5 4 STK FLANGE NUT 1-8 THD
4 1 MS TOP PLATE CARB & HARD 11.5ø X 2.13
3 1 PWR ENERPAC CYLINDER
2 4 4140 ROD 1.08 X 23.0
1 1 TS COLLAR (SEE SHT# 2) 11.75ø X 3.0
ITEM DESCRIPTION STOCK SIZE

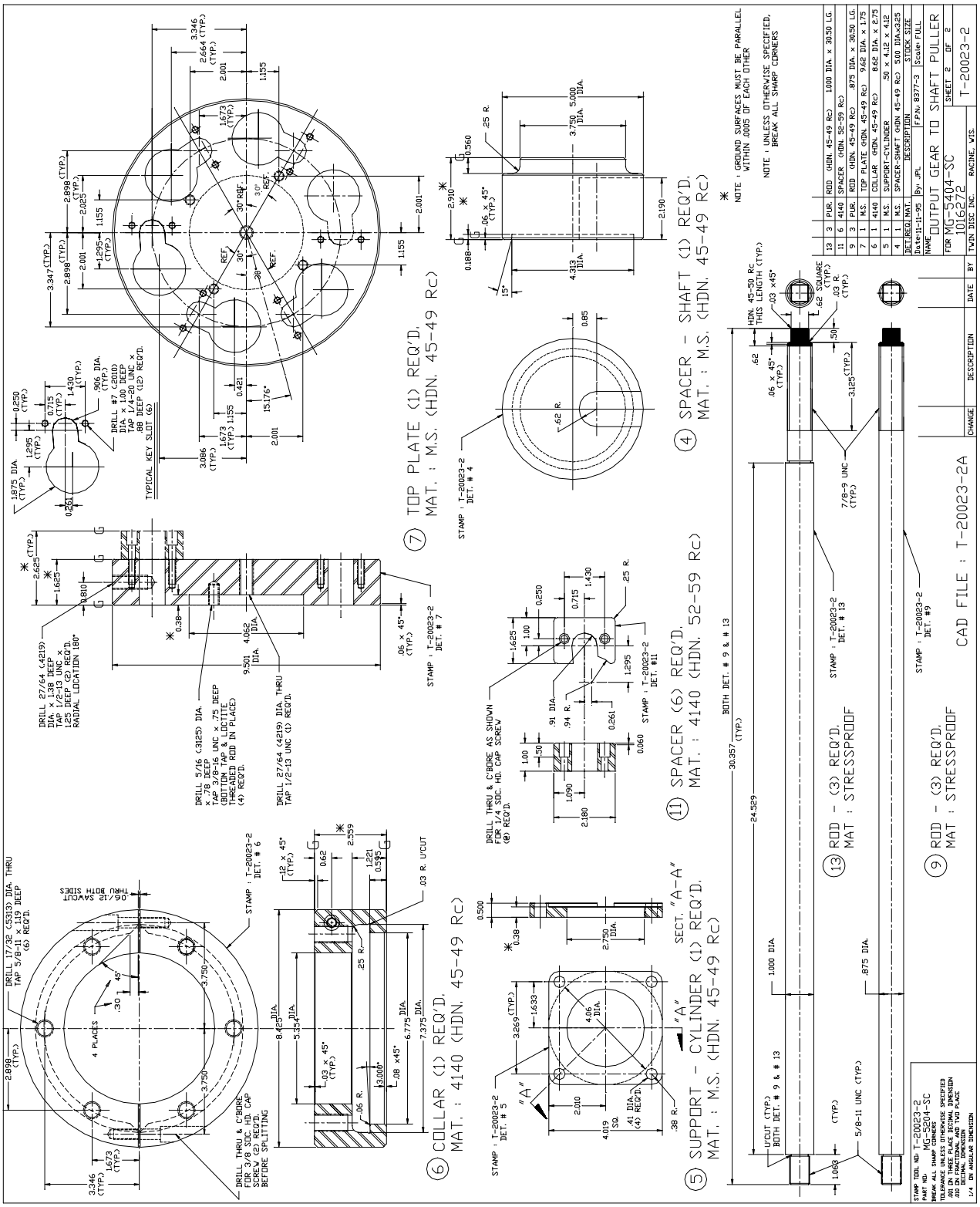
# 11-23 Spacer for SKF Hydraulic Assembly T-20023 - Sh. 4 of 4


.03 x 45 °(3)PLACES
5.50 DIA
3.16
1.00
.16
4.999
4.997 DIA
.01 R-MAX
.63
1.25
16 1 M.S. SPACER C & H 5.75 DIA x 3.38
DET. REQ. MAT. DESCRIPTION STOCK SIZE
DATE 12-6-93 BY JIM T. SCALE: FULL
NAME SPACER FOR SKF HYDR. ASS'Y
FOR MG5202 SHEET 4 OF 4
TWIN DISC INC. RACINE,WIS. T-20023
D C B A
CHANGE DESCRIPTION DATE BY
AUTOCAD 14 FILE T-20023
STAMP TOOL NO. T-20023 DET 16
PART NO. MG5202
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
+-.010 ON TWO PLACE DECIMAL DIMENSION
+-.005 ON THREE PLACE DECIMAL DIMENSION
+-.010 ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
+-1/4 DEGREE ON ANGULAR DIMENSION

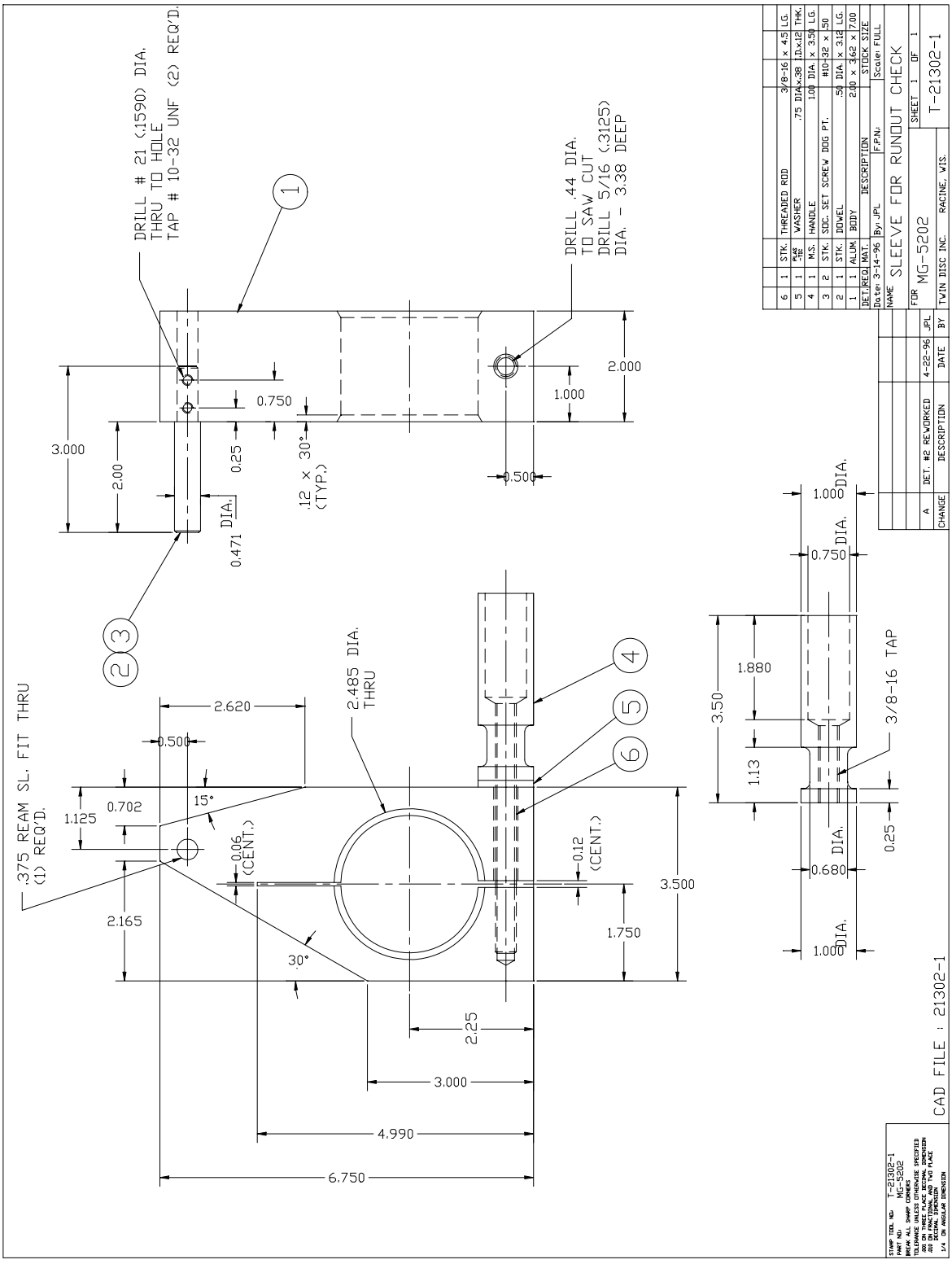
# 11-24 Output Gear & Shaft Puller for Assembly T-20023-2 - Sh. 1 of 2



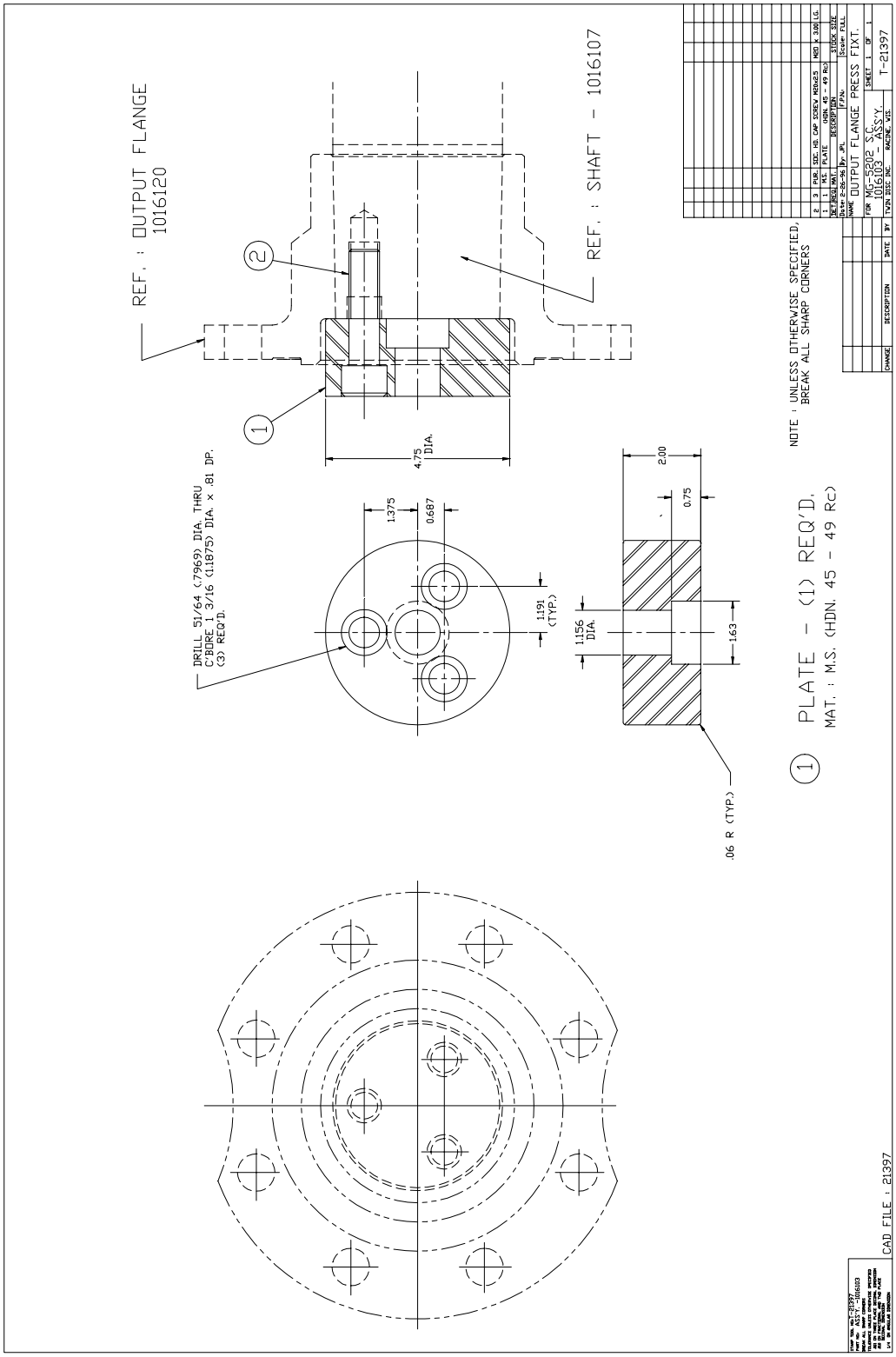
# 11-25 Output Gear & Shaft Puller for Assembly T-20023-2 - Sh. 2 of 2


7 TOP PLATE (1) REQ'D. MAT. : M.S. (HDN. 45-49 Rc)
4 SPACER - SHAFT (1) REQ'D. MAT. : M.S. (HDN. 45-49 Rc)
11 SPACER (6) REQ'D. MAT. : 4140 (HDN. 52-59 Rc)
6 COLLAR (1) REQ'D. MAT. : 4140 (HDN. 45-49 Rc)
5 SUPPORT - CYLINDER (1) REQ'D. MAT. : M.S. (HDN. 45-49 Rc)
13 ROD - (3) REQ'D. MAT : STRESSPROOF
9 ROD - (3) REQ'D. MAT : STRESSPROOF
NOTE : GROUND SURFACES MUST BE PARALLEL WITHIN .0005 OF EACH OTHER
NOTE : UNLESS OTHERWISE SPECIFIED, BREAK ALL SHARP CORNERS
NAME OUTPUT GEAR TO SHAFT PULLER
FOR MG-5404-SC
1016272
T-20023-2
SHEET 2 OF 2
TWIN DISC INC. RACINE, WIS.
CAD FILE : T-20023-2A

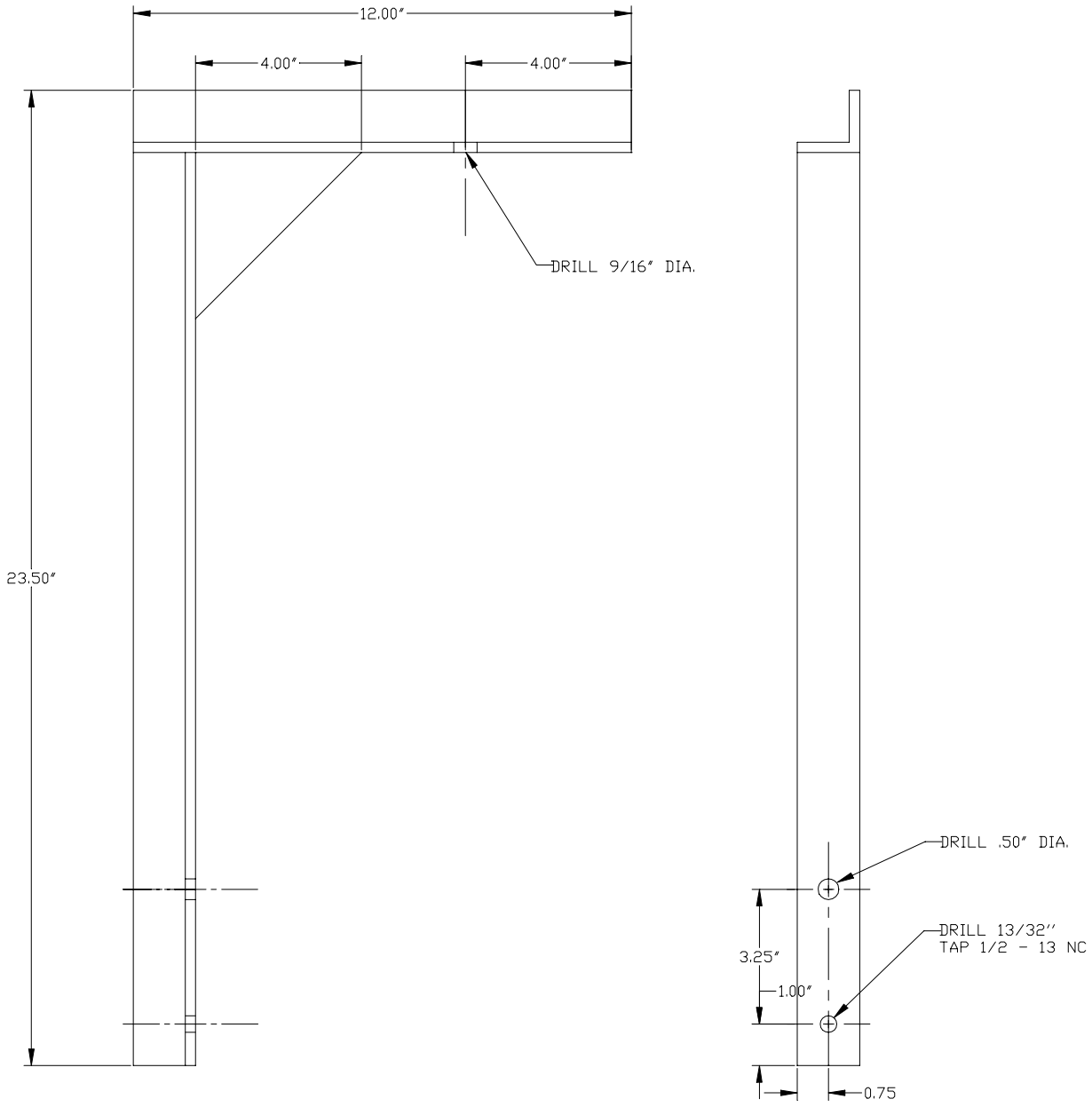
# 11-26 Sleeve for Runout Check T-21302-1

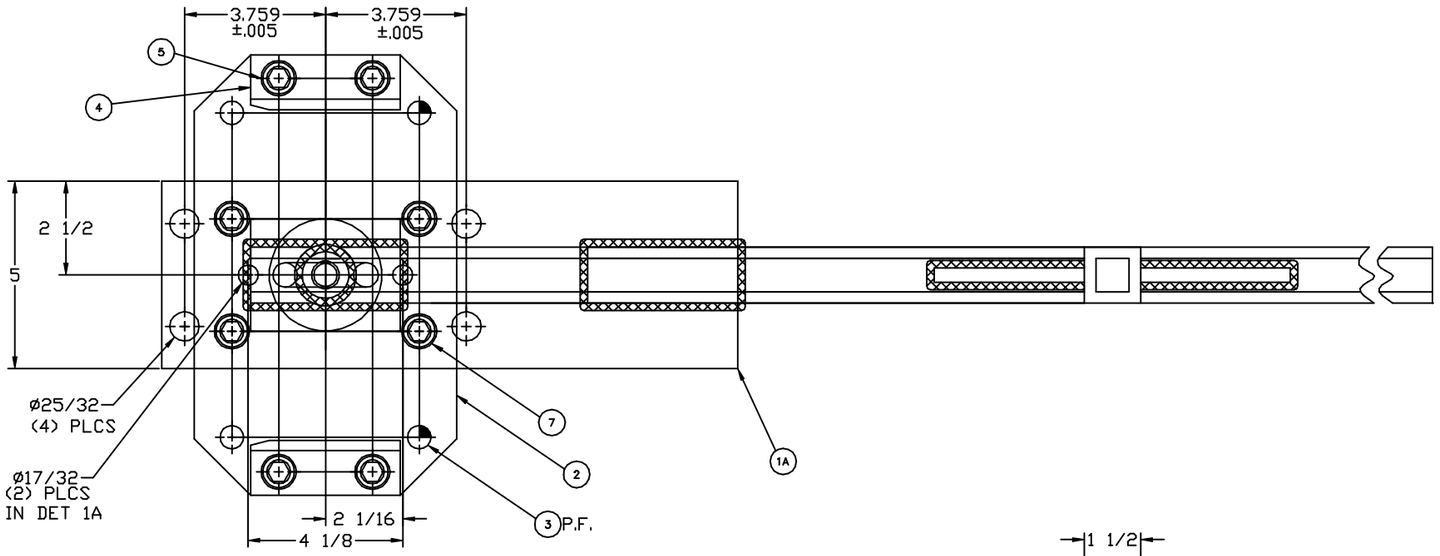


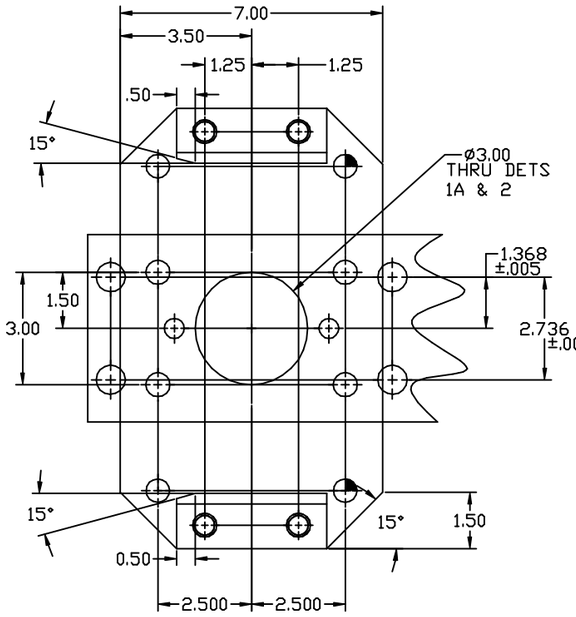
# 11-27 Output Flange Press Fixture T-21397



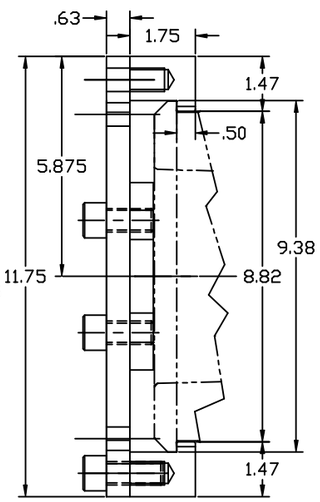
# 11-28 Lifting Bracket for Clutch Removal in Boat

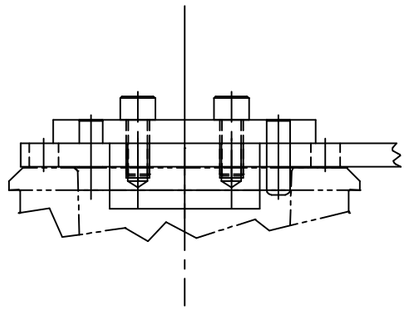


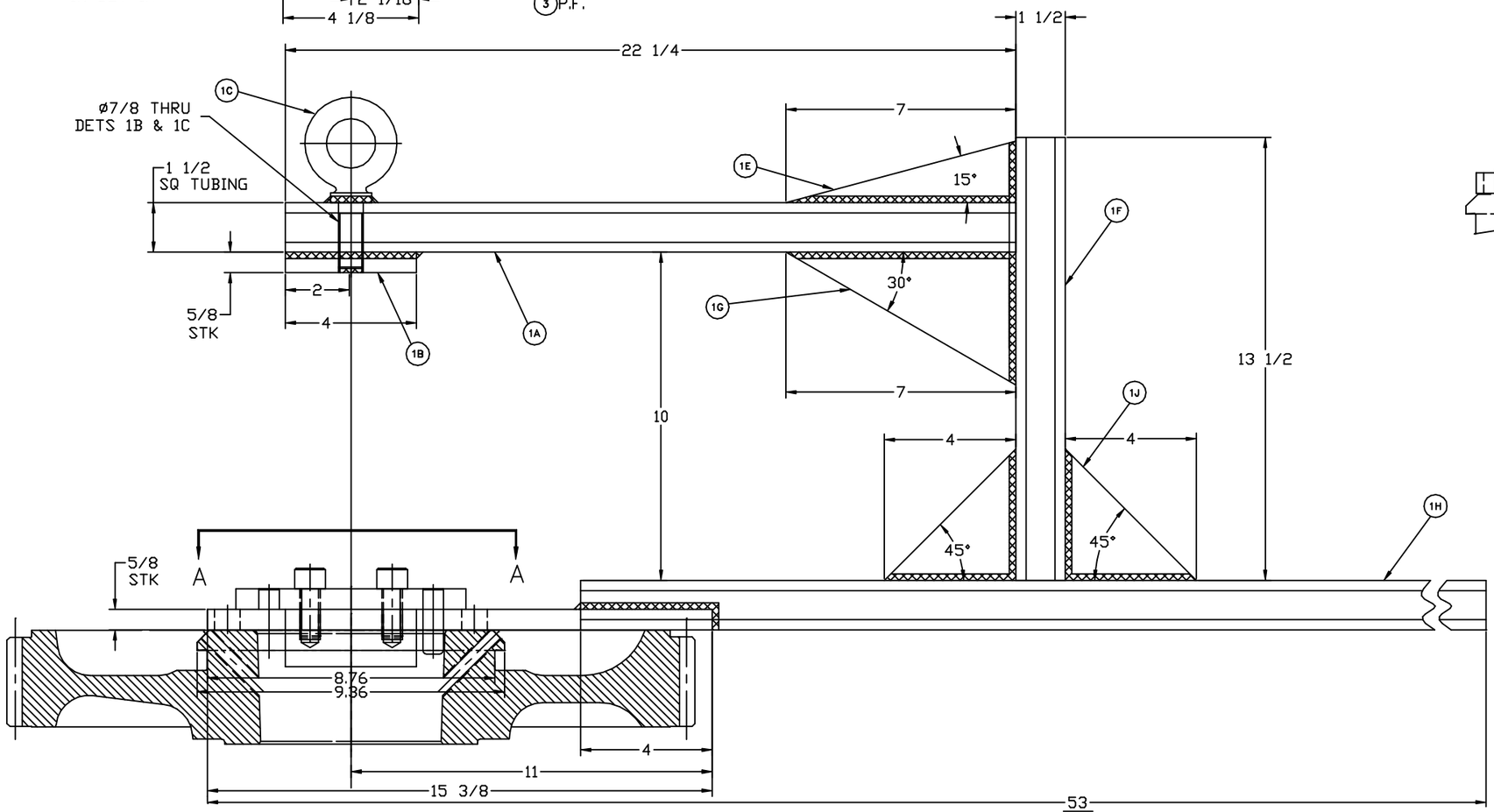



VIEW A-A






NOTE:
HOLD DRILLED, C'BORED AND/OR TAPPED HOLES ±.005

| | | | | |
|---|---|---|---|---|
| 7 | 4 | STK | SHCS | 5/8-11 X 1.25 |
| 6 | 2 | PUR | BALL L OCK PIN CL-10-BLPB-2 | |
| 5 | 4 | STK | SHCS | 5/8-11 X 1.5 LG |
| 4 | 2 | MS | GRIPPER (1) R.H. & (1) L.H. 1.5 X 1.8 X 4.13 | |
| 3 | 2 | STK | DOWEL | 5/8 DIA X 2 |
| 2 | 1 | MS | HANGER CROSS PLATE | 5/8 X 7 X 11.8 |
| | | | | |
| 1H | 1 | MS | HANGER ARM | 1.5 SQ X 41.5 TUBING |
| 1G | 1 | MS | BOTTOM GUSSET (TOP ARM) | 3/8 X 4 X 7 |
| 1F | 1 | MS | VERTICAL | 1.5 SQ X 13.5 TUBING |
| 1E | 1 | MS | GUSSET (TOP ARM) | 3/8 X 2 X 7 |
| 1D | 1 | MS | EYE BOLT ARM | 1.5 SQ X 24.5 TUBING |
| 1C | 1 | STK | SHOULDER FORGED EYE BOLT | 3/4-10 |
| 1B | 1 | MS | EYE BOLT PAD | 5/8 X 3 X 4 |
| 1A | 1 | MS | CLAMP PLATE | 5/8 X 5.0 X 15.40 |
| 1 | 1 | | WELDMENT DETS 1A-1H & 1J | |

| DET. | REQ. | MAT. | DESCRIPTION | STOCK SIZE |
|---|---|---|---|---|
| Date: 10-2-84 | | By: BOB SPATH | F.P.N.: | Scale: HALF |

NAME OUT PUT GEAR LIFTING FIXTURE FOR ASSEMBLY DEPT 344

FOR XA7470, A7496A, A7491A, A7486A, 1002580, A7501A

SHEET 1 OF 1

TWIN DISC INC. RACINE, WIS.

T-19987

| REV | DESCRIPTION | DATE | BY |
|---|---|---|---|
| D | REDRAWN TO AUTOCAD14 | 12-3-99 | TMV |

STAMP TOOL NO.: T-19987
PART NO.: XA7470
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
±.0002 ON FOUR PLACE DECIMAL DIMENSION
±.001 ON THREE PLACE DECIMAL DIMENSION
±.010 ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION

| SYMBOL | CHARACTERISTIC |
|---|---|
| ▱ | FLATNESS |
| // | PARALLELISM |
| ⊥ | PERPENDICULARITY |
| ◎ | CONCENTRICITY |
| ↗ | CIRCULAR RUNOUT |
| ↗↗ | TOTAL RUNOUT |
| ⌖ | POSITION |

| SYMBOL | MODIFIER |
|---|---|
| Ⓜ | MMC (MAX. MATERIAL CONDITION) |
| Ⓢ | RFS (REGARDLESS OF FEATURE SIZE) |

| SYMBOL | NAME |
|---|---|
| -A- | DATUM FEATURE |
| ø | DIAMETER |

AUTOCAD FILE ~ T-19987

Section 12

# Torque Charts

## 12.1 Metric Coarse Thread Capscrews, Bolts and Nuts

Refer to the next two pages.

## 1 of 2 - Torque Values for Metric Coarse Thread Capscrews, Bolts, and Nuts

| **Dry (as received)** See note below | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Thread Size** | **Property Class 8.8** Torque in N-m ($lb_f$-ft) | | | **Property Class 10.9** Torque in N-m ($lb_f$-ft) | | | **Property Class 12.9** Torque in N-m ($lb_f$-ft) | | |
| | **Min.** | **Nominal** | **Max.** | **Min.** | **Nominal** | **Max.** | **Min.** | **Nominal** | **Max.** |
| **M6** | 11(8.2) | 12 (8.9) | 13 (9.5) | 15 (11) | 16 (12) | 17 (13) | 18 (13) | 19 (14) | 20 (15) |
| **M8** | 26 (19) | 28 (20.7) | 30 (22) | 38 (28) | 41 (30) | 44 (32) | 44 (32) | 47 (35) | 50 (37) |
| **M10** | 53 (39) | 57 (42) | 61(45) | 74 (55) | 80 (59) | 86 (63) | 86 (63) | 92 (68) | 98 (73) |
| **M12** | 92 (68) | 99 (73) | 106 (78) | 131 (97) | 141 (104) | 151 (111) | 153 (113) | 165 (122) | 177 (130) |
| **M14** | 148 (109) | 159 (117) | 169 (125) | 207 (153) | 222 (164) | 237 (175) | 242 (178) | 260 (192) | 278 (205) |
| **M16** | 223 (165) | 240 (117) | 257 (189) | 318 (235) | 342 (252) | 366 (270) | 372 (274) | 400 (295) | 428 (316) |
| **M18** | 306 (226) | 329 (243) | 353 (260) | 435 (321) | 468 (345) | 500 (369) | 521 (384) | 560 (413) | 599 (442) |
| **M20** | 435 (321) | 468 (345) | 501 (369) | 614 (453) | 660 (487) | 706 (521) | 744 (549) | 800 (590) | 856 (631) |
| **M24** | 752 (555) | 809 (597) | 866 (638) | 1060 (782) | 1140 (841) | 1220 (900) | 1256 (926) | 1350 (996) | 1445 (1065) |
| **M30** | 1349 (995) | 1450 (1069) | 1552 (1144) | 2046 (1509) | 2200 (1623) | 2354 (1736) | 2511 (1852) | 2700 (1991) | 2889 (2131) |

**Note:**

Use these torque values for all capscrews, bolts, and nuts coated only with the manufacturer s rust preventative oil and use for all parts wiped or washed nearly free of oil. Do not use for plated parts.

T-14d

## 2 of 2 - Torque Values for Metric Coarse Thread Capscrews, Bolts, and Nuts

| **Lubricated** See notes below | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Thread Size** | **Property Class 8.8** Torque in N-m ($lb_f$-ft) | | | **Property Class 10.9** Torque in N-m ($lb_f$-ft) | | | **Property Class 12.9** Torque in N-m ($lb_f$-ft) | | |
| | **Min.** | **Nominal** | **Max.** | **Min.** | **Nominal** | **Max.** | **Min.** | **Nominal** | **Max.** |
| **M6** | 8.8 (6.5) | 9.5 (7) | 10.2 (7.5) | 12 (8.9) | 13 (9.6) | 14 (10) | 14 (10) | 15 (11) | 16 (12) |
| **M8** | 21 (16) | 23 (17) | 25 (18) | 31 (23) | 33 (24) | 35 (26) | 34 (25) | 37 (27) | 40 (29) |
| **M10** | 43 (32) | 46 (34) | 49 (36) | 60 (44) | 64 (47) | 69 (51) | 70 (51) | 75 (55) | 80 (59) |
| **M12** | 74 (55) | 80 (59) | 86 (63) | 104 (77) | 112 (83) | 120 (88) | 121 (89) | 130 (96) | 139 (103) |
| **M14** | 117 (86) | 126 (93) | 136 (100) | 165 (122) | 178 (131) | 190 (140) | 191 (141) | 205 (151) | 219 (162) |
| **M16** | 179 (132) | 192 (142) | 205 (152) | 256 (189) | 275 (203) | 294 (217) | 298 (219) | 320 (236) | 342 (253) |
| **M18** | 245 (181) | 264 (195) | 283 (209) | 348 (257) | 374 (276) | 400 (295) | 409 (302) | 440 (325) | 471 (347) |
| **M20** | 348 (257) | 374 (276) | 400 (295) | 493 (364) | 530 (391) | 567 (418) | 581 (429) | 625 (461) | 669 (493) |
| **M24** | 603 (445) | 648 (478) | 693 (511) | 848 (626) | 912 (673) | 976 (720) | 1000 (737) | 1075 (793) | 1150 (848) |
| **M30** | 967 (713) | 1040 (767) | 1113 (821) | 1674 (1235) | 1800 (1328) | 1926 (1421) | 2000 (1475) | 2150 (1586) | 2301 (1697) |

**Notes:**

Use these torque values for all capscrews, bolts, and nuts whose threads and washer face are lubricated. Also for screws or nuts whose washer face is assembled against a hardened washer or smooth finished part (Rc 40 or above and 40AA max.). Also use for plated screws (except zinc plated). Lubricating the threads and screw or nut face with SAE 20 or 30 oil is recommended for best results for all the property class 10.9 screws and is required for all the universal joint bearing capscrews.

Do not use moly-disulfide, white lead, copper filled, or other such filled lubricants with these torque values. Such lubricants require special torque values.

T-15

## 12.2 US Standard Unit Capscrews, Bolts and Nuts

**1 of 2 - Torque Values for U.S. Standard Unit Capscrews, Bolts and Nuts**

| Torque N-m (lbf-ft) for Coarse and Fine Threads (As Received) | | | | | | |
|---|---|---|---|---|---|---|
| Nominal Thread Diameter | SAE Grade 5 | | | SAE Grade 8 | | |
| | Min. | Nom. | Max. | Min. | Nom. | Max. |
| 1/4 | 11 (8) | 12 (9) | 14 (10) | 18 (13) | 19 (14) | 20 (15) |
| 5/16 | 23 (17) | 25.8 (19) | 28.5 (21) | 34 (25) | 36.6 (27) | 39 (29) |
| 3/8 | 41 (30) | 45 (33) | 49 (36) | 57 (42) | 62 (46) | 68 (50) |
| 7/16 | 65 (48) | 71 (52) | 76 (56) | 91 (67) | 99 (73) | 107 (79) |
| 1/2 | 100 (74) | 108 (80) | 117 (86) | 141 (104) | 152 (112) | 163 (120) |
| 9/16 | 141 (104) | 152 (112) | 163 (120) | 198 (146) | 214 (158) | 230 (170) |
| 5/8 | 198 (146) | 214 (158) | 230 (170) | 282 (208) | 304 (224) | 325 (240) |
| 3/4 | 353 (260) | 380 (280) | 407 (300) | 488 (360) | 529 (390) | 569 (420) |
| 7/8 | 564 (416) | 607 (448) | 651 (480) | 786 (580) | 854 (630) | 922 (680) |
| 1 | 854 (630) | 922 (680) | 990 (730) | 1207 (890) | 1302 (960) | 1396 (1030) |
| 1-1/8 | 1071 (790) | 1152 (850) | 1234 (910) | 1708 (1260) | 1844 (1360) | 1979 (1460) |
| 1-1/4 | 1478 (1090) | 1593 (1175) | 1708 (1260) | 2305 (1700) | 2508 (1850) | 2712 (2000) |

**Note:**
Use these torque values for all capscrews, bolts and nuts coated only with the manufacturer s rust preventative oil and use for all parts wiped or washed nearly free of oil. Do not use for plated parts.

T-20

**2 of 2 - Torque Values for U.S. Standard Unit Capscrews, Bolts and Nuts**

| Torque N-m (lbf-ft) for Coarse and Fine Threads (Lubricated) | | | | | | |
|---|---|---|---|---|---|---|
| Nominal Thread Diameter | SAE Grade 5 | | | SAE Grade 8 | | |
| | Min. | Nom. | Max. | Min. | Nom. | Max. |
| 1/4 | 8 (6) | 9.5 (7) | 11 (8) | 14 (10) | 15 (11) | 16 (12) |
| 5/16 | 17.6 (13) | 20 (15) | 23 (17) | 27 (20) | 30 (22) | 33 (24) |
| 3/8 | 34 (25) | 37 (27) | 39 (29) | 47 (35) | 52 (38) | 56 (41) |
| 7/16 | 50 (37) | 54 (40) | 58 (43) | 75 (55) | 81 (60) | 88 (65) |
| 1/2 | 81 (60) | 88 (65) | 95 (70) | 113 (83) | 122 (90) | 132 (97) |
| 9/16 | 111 (82) | 122 (90) | 133 (98) | 163 (120) | 176 (130) | 190 (140) |
| 5/8 | 163 (120) | 176 (130) | 190 (140) | 224 (165) | 244 (180) | 264 (195) |
| 3/4 | 278 (205) | 305 (225) | 332 (245) | 400 (295) | 434 (320) | 468 (345) |
| 7/8 | 447 (330) | 488 (360) | 529 (390) | 637 (470) | 691 (510) | 746 (550) |
| 1 | 671 (495) | 732 (540) | 793 (585) | 969 (715) | 1051 (775) | 1132 (835) |
| 1-1/8 | 834 (615) | 915 (675) | 997 (735) | 1376 (1015) | 1491 (1100) | 1607 (1185) |
| 1-1/4 | 1152 (850) | 1254 (925) | 1356 (1000) | 1864 (1375) | 2034 (1500) | 2203 (1625) |

**Note:**
Use these torque values for all capscrews, bolts and nuts whose threads and washer face are lubricated. Also for screws or nuts whose washer face is assembled against a hardened washer or smooth finished part (Rc 40 or above and 40AA max.). Also use for plated screws (except zinc plated). Lubricating the threads and screws or nut face with SAE 20 or 30 oil is recommended for best results for all Grade 8 screws.

Do not use moly-disulfide, white lead, copper filled, or other such filled lubricants with these torque values. Such lubricants require special torque values.

T-21

## 12.3 Tapered Pipe Plugs

| **Torque Values for Lubricated Pipe Plugs**<br>Recommended Torque in N-m (Lb$_f$-ft) | | |
|---|---|---|
| **NPTF** Size | **Installed in Cast Iron or Steel** | **Installed in Aluminum** |
| 1/16 - 27 | 11.5 ± 1.3 (8.5 ± 1.0) | 7.5 ± 0.9 (5.5 ± 0.7) |
| 1/8 - 27 | 14.2 ± 1.8 (10.5 ± 1.3) | 8.8 ± 1.1 (6.5 ± 0.8) |
| 1/4 - 18 | 34 ± 4 (25 ± 3) | 22 ± 3 (16 ± 2) |
| 3/8 - 18 | 37 ± 4 (27 ± 3) | 23 ± 3 (17 ± 2) |
| 1/2 - 14 | 68 ± 8 (50 ± 6) | 41 ± 5 (30 ± 4) |
| 3/4 - 14 | 73 ± 10 (54 ± 7) | 46 ± 5 (34 ± 4) |
| 1 - 11-1/2 | 109 ± 13 (80 ± 10) | 68 ± 8 (50 ± 6) |
| 1-1/4 - 11-1/2 | 115 ± 13 (85 ± 10) | 75 ± 9 (55 ± 7) |
| 1-1/2 - 11-1/2 | 115 ± 13 (85 ± 10) | 75 ± 9 (55 ± 7) |

**Notes:**

The lubricant is to be John Crane insoluble plastic lead seal No. 2 (or equivalent), or Loctite® No. 92 (or equivalent) and plugs are to be capable of removal without damage. Overtightening may cause initial leakage, plus potential removal damage.

An option of a maximum of two full turns after finger tightening the plug may be used if required and if removal conditions are met.

T-22

## 12.4 Tube Fittings, Hose Fittings, Plugs with O-Rings

For 37°, 45°, and inverted flare fittings per SAE standards J512, J514, J516.

| Straight Threaded Tube Fittings, Hose Fittings, and Plugs with O-Rings | | | |
|---|---|---|---|
| Nominal Thread OD | Nominal Tube OD | Tightening Torque N-m (Lb$_f$-ft) | Tightening Torque Equivalent (Lb$_f$-in) |
| 5/16 | 1/8 | 4.9 ± 0.7 (3.6 ± 0.5) | 43 ± 6 |
| 3/8 | 3/16 | 11.7 ± 1.4 (8.6 ± 1.0) | 103 ± 12 |
| 7/16 | 1/4 | 16 ± 2 (12 ± 1.5) | 144 ± 18 |
| 1/2 | 5/16 | 20 ± 3 (15 ± 2) | 180 ± 24 |
| 9/16 & 5/8 | 3/8 | 24 ± 3 (18 ± 2) | 216 ± 24 |
| 11/16 | 7/16 | 34 ± 4 (25 ± 3) | |
| 3/4 | 1/2 | 41 ± 5 (30 ± 4) | |
| 7/8 | 5/8 | 54 ± 7 (40 ± 5) | |
| 1-1/16 | 3/4 | 75 ± 9 (55 ± 7) | |
| 1-3/16 & 1-1/4 | 7/8 | 88 ± 11 (65 ± 8) | |
| 1-5/16 & 1-3/8 | 1 | 108 ± 14 (80 ± 10) | |
| 1-5/8 | 1-1/4 | 136 ± 16 (100 ± 12) | |
| 1-7/8 | 1-1/2 | 163 ± 20 (120 ± 15) | |
| 2-1/2 | 2 | 312 ± 41 (230 ± 30) | |

T-24

## 12.5 ISO6149 Port Fittings

| Torque Values for ISO 6149 O-Ring Port Fittings | |
|---|---|
| **Tread Size** | **Recommended Torque: N-m (lbf-ft)** |
| **M10 x 1.5** | 25 (18) |
| **M12 x 1.5** | 35 (26) |
| **M14 x 1.5** | 45 (33) |
| **M16 x 1.5** | 55 (41) |
| **M18 x 1.5** | 70 (52) |
| **M22 x 1.5** | 100 (74) |
| **M27 x 2** | 81 (60)<br>(Aluminum Valve Body) |

T-23

Section 13

# Illustrations

## 13.0 List of Illustrations

This section contains the following illustrations:

**13.1 Clutch Group**

**13.2 Selector Valve**

**13.3 Suction Strainer**

**13.4 Filter**

**13.5 Transmission Rear View (MG5202SC, MG5203SC, MG5204SC)**

**13.5a Transmission Rear View (MG5202DC)**

**13.6 Transmission Section View (MG5202SC, MG5203SC, MG5204SC)**

**13.6a Transmission Section View (MG5202DC)**

**13.7 Control Valve Group**

**13.8 Control Valve Group**

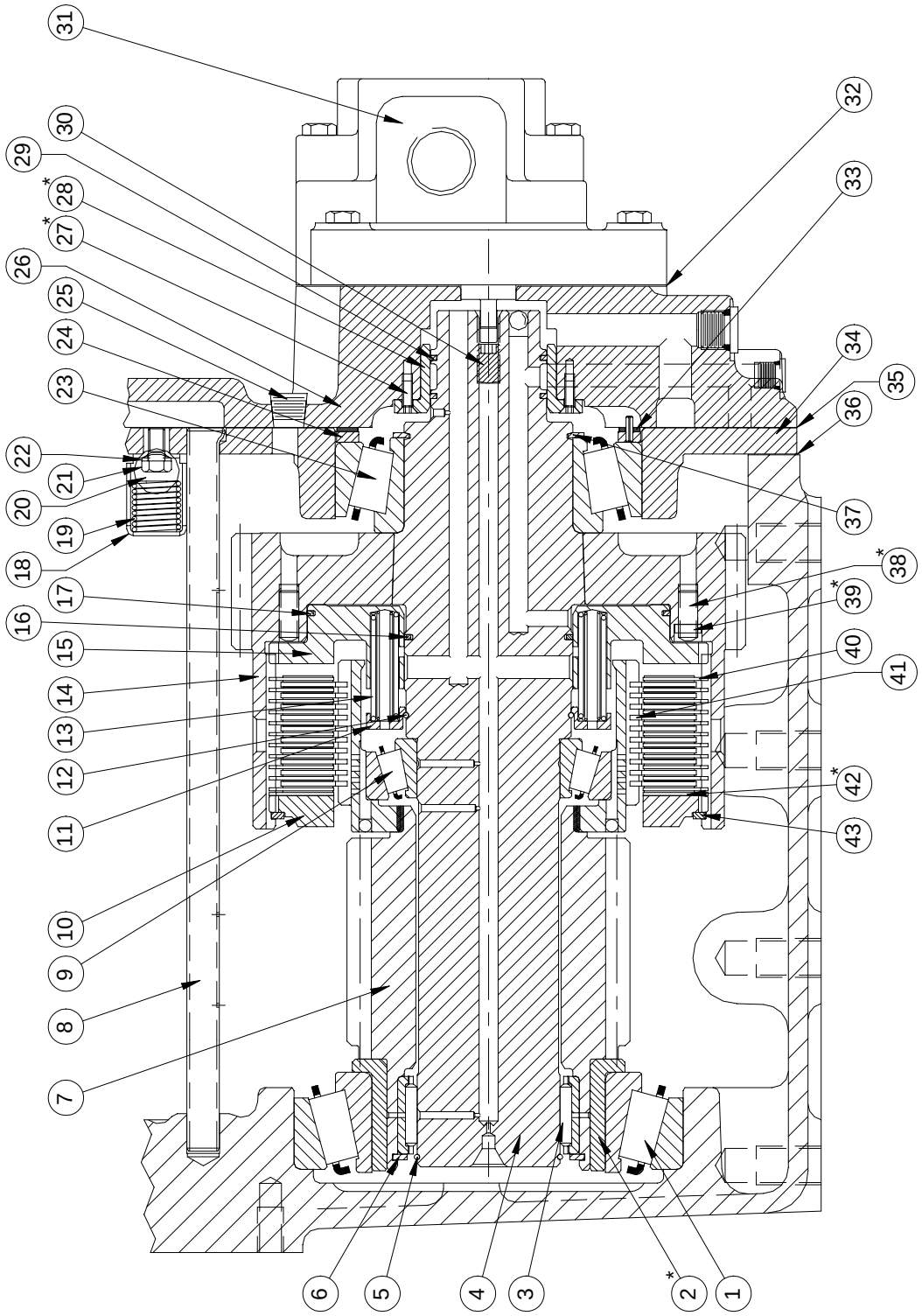
**13.9 Trolling Valve Group**

| Item | Qty. | Description |
|---|---|---|
| 1 | 2 | Bearing, tapered roller (primary & secondary shaft front bearing) |
| 2* | 2 | Spacer |
| 3 | 2 | Bearing, needle roller |
| 4 | 1 | Shaft assembly, secondary |
| 5 | 2 | Ring, snap (external) (primary & secondary shaft @ needle bearing) |
| 6 | 2 | Ring, snap (internal) (pinion @ needle bearing) |
| 7 | 2 | Pinion assembly, input (primary & secondary) |
| 8 | 1 | Tube, lube |
| 9 | 2 | Bearing, tapered roller (primary & secondary shaft, rear bearing) |
| 10 | 2 | Backplate, clutch |
| 11 | 2 | Retainer, spring (primary & secondary shaft) |
| 12 | 2 | Ring, snap (external) (primary & secondary shaft @ spring retainer) |
| 13 | 32 | Spring assembly (primary & secondary clutch), consists of: 1 Spring, inner 1 Spring, outer |
| 14 | 1 | Gear, transfer (secondary shaft) (LH helix) |
| 15 | 2 | Piston, clutch |
| 16 | 2 | Ring, piston (clutch piston) |
| 17 | 2 | Ring, piston (clutch piston) |
| 18 | 1 | Housing, relief valve (lube) |
| 19 | 1 | Spring, relief valve (lube) |
| 20 | 1 | Ball, steel (lube, relief valve) |
| 21 | 2 | Screw, hex head (lube relief valve) |
| 22 | 2 | Washer, lube relief valve |
| 23 | 2 | Bearing, tapered roller (primary & secondary shaft rear bearing) |
| 24 | 2 | Retainer assembly, shim (primary & secondary shaft rear bearing) consists of: 1 Retainer, shim 2 Pin, roll |
| 25 | 4 | Plug, pipe (manifold come home) |
| 26 | 1 | Manifold assembly consists Of: 1 Manifold 1 Ball, steel |
| 27* | 4 | Screw, flat head machined (manifold bushings) |
| 28* | 1 | Bushing, manifold (secondary shaft) |
| 29 | 4 | Ring piston (primary & secondary shaft at manifold) |
| 30 | 2 | Screw, set |
| 31 | 1 | Pump, oil |
| 32 | 1 | Gasket, oil pump |
| 33 | AR | Shim, bearing (.005 , .007 , .020 ) (primary & secondary shaft rear bearing) |
| 34 | 1 | Carrier, bearing (primary & secondary shaft rear bearing) |
| 35 | 1 | Gasket, manifold |
| 36 | 1 | Gasket, bearing carrier |
| 37 | 2 | Ring, snap (external) (primary & secondary) |
| 38* | 8 | Setscrew, oval point (primary & secondary transfer gear) |
| 39* | 8 | Pin, roll (transfer gears at setscrew) |
| 40 | 20 | Plate steel |
| 41 | 22 | Plate, friction, clutch |
| 42* | 2 | Plate, clutch shim |
| 43 | 2 | Ring, snap (internal) transfer gear @ clutch backplate |

**When two sets of dimensions are given, the first dimension is for English units, and the second dimension is for metric units.**

*** Denotes parts that may not be used on all models**

5202 C HL3 Clutch.wpd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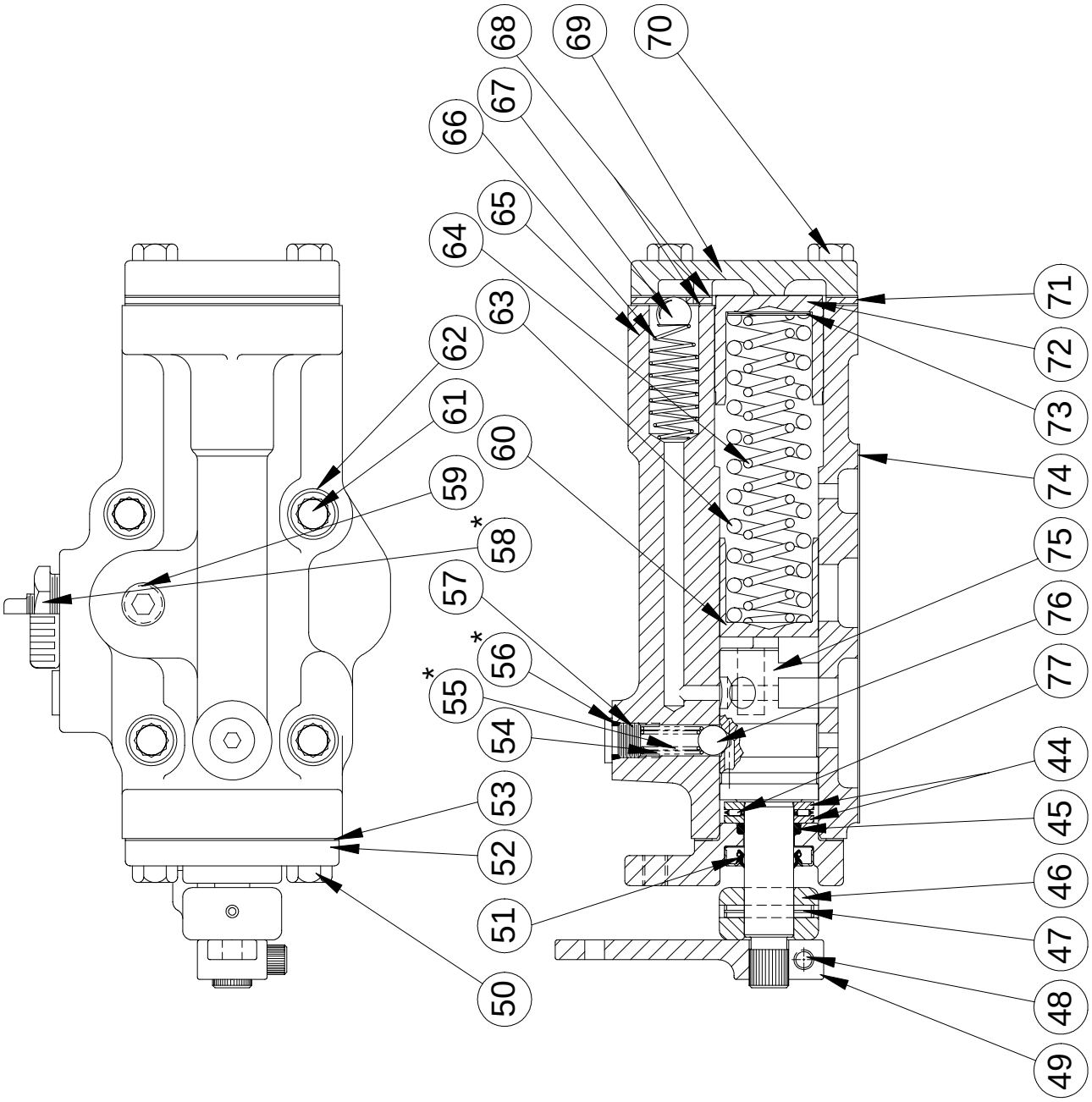
## 13.2 Selector Valve

| Item | Qty. | Description |
|---|---|---|
| 44 | 2 | Race, thrust |
| 45 | 1 | O-ring (valve cover) |
| 46 | 1 | Collar, stop |
| 47 | 1 | Pin, roll |
| 48 | 1 | Screw, Socket head |
| 49 | 1 | Lever, shift |
| 50 | 1 | Screw, hex head |
| 51 | 1 | Seal, oil |
| 52 | 1 | Cover, valve |
| 53 | 1 | Gasket (valve cover) |
| 54 | 1 | Spring (outer) (ball detent) |
| 55* | 1 | Spring (inner) (ball detent) |
| 56* | 2 | O-ring |
| 57 | 2 | Plug |
| 58* | 1 | Plug (valve inlet) |
| 59 | 1 | Plug |
| 60 | 1 | Piston (pressure regulating) |
| 61 | 4 | Screw (12pt head or socket head depending on model) |
| 62 | 4 | Closure, plastic (valve to manifold screw holes) |
| 63 | 1 | Spring, outer pressure regulating |
| 64 | 1 | Spring, inner pressure regulating |
| 65 | 1 | Body, valve |
| 66 | 1 | Spring, check ball |
| 67 | 1 | Ball, steel check |
| 68 | 2 | Gasket, (orifice plate and orifice plate cover use same gasket) |
| 69 | 1 | Cover, orifice plate |
| 70 | 4 | Screw, hex head |
| 71 | 1 | Plate, orifice |
| 72 | 1 | Piston, rate-of-rise |
| 73 | AR | Shim |
| 74 | 1 | Gasket, valve |
| 75 | 1 | Stem, valve |
| 76 | 1 | Ball, detent |
| 77 | 1 | Bearing, needle thrust |

*** Denotes parts that may not be used on all models**

5.22Z CH 13 valve.wpd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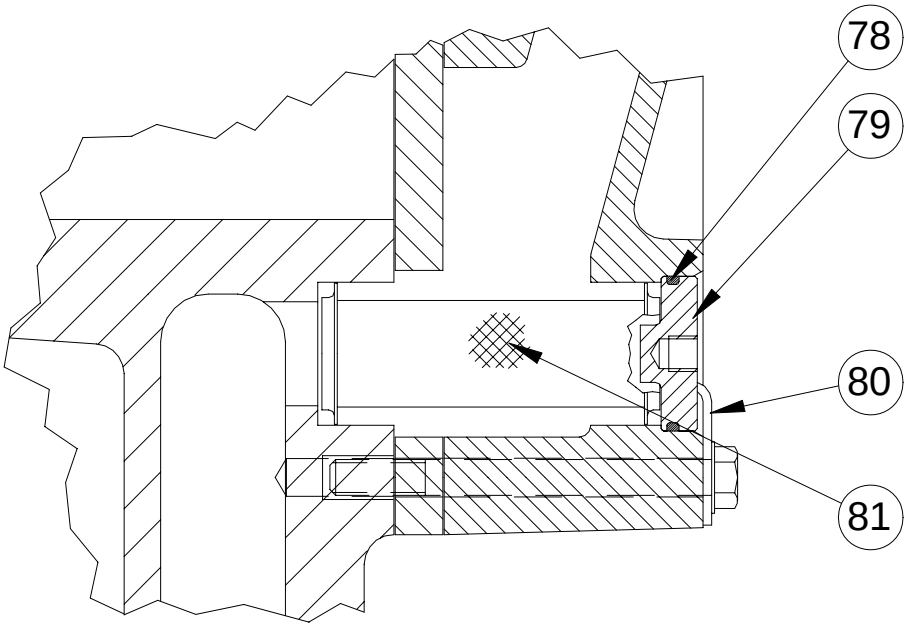
## 13.3 Suction Strainer

| Item | Qty. | Description |
|---|---|---|
| 78 | 1 | O-ring (suction strainer cover) |
| 79 | 1 | Cover, suction strainer |
| 80 | 1 | Plate, clamp (manifold @ suction strainer cover) |
| 81 | 1 | Strainer, suction |

5202 CH13 Suction strainer.wpd

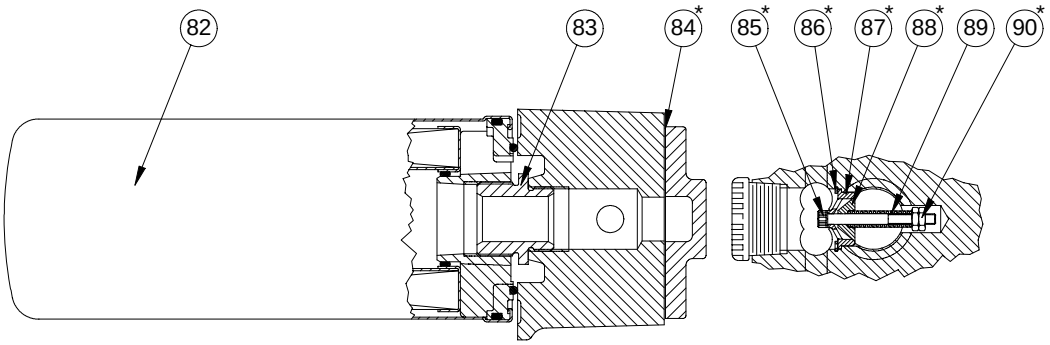


## 13.4 Filter

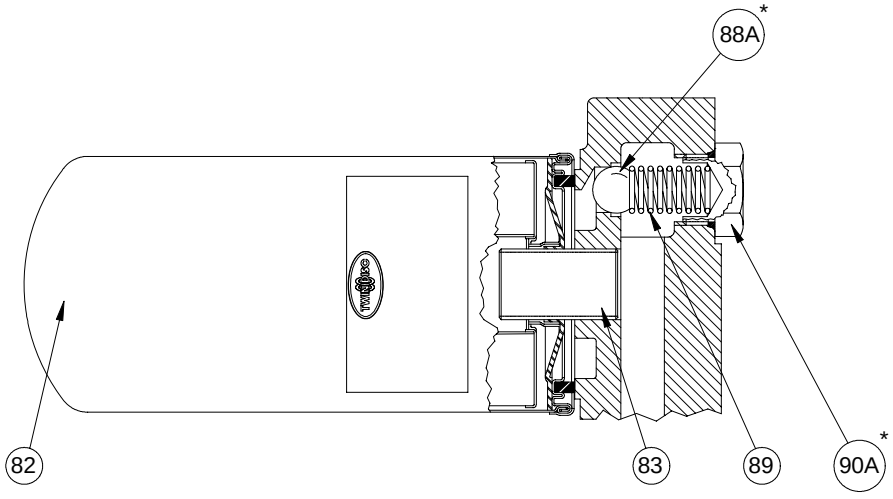
| Item | Qty. | Description |
|---|---|---|
| 82 | 1 | Filter assembly |
| 83 | 1 | Fitting, threaded (filter to manifold) |
| *84 | 1 | Gasket, ditch plate |
| *85 | 1 | Screw, socket head (filter bypass valve) |
| *86 | 1 | Ring, retaining (filter bypass valve) |
| *87 | 1 | Seat, valve (filter bypass) |
| *88 | 1 | Cone (filter bypass) |
| *88A | 1 | Ball |
| 89 | 1 | Spring (filter bypass valve) |
| 90 | 2 | Nut (filter bypass valve) |
| 90A | 1 | Plug (MG5202DC only) |

*** Denotes parts that may not be used on all models**

5202 CH13 filter.wpd




MG5202SC, MG5203SC, MG204SC




MG5202DC

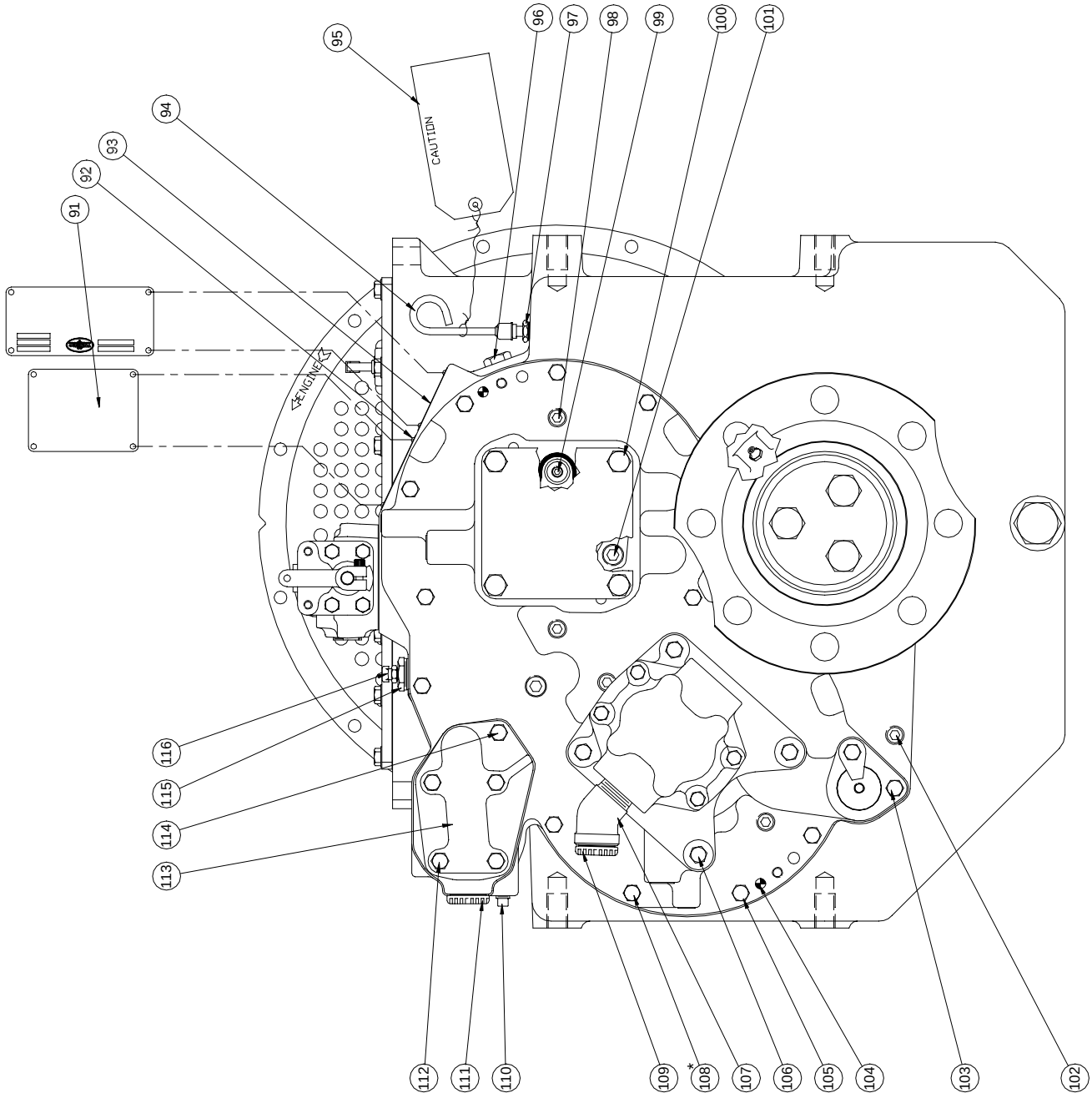
# MG5202 SC, MG5203 SC, MG5204 SC

| Item | Qty. | Description | Item | Qty. | Description |
|---|---|---|---|---|---|
| 91 | 1 | Plate, instruction (lube) | 103 | 2 | Screw, hex head (manifold and strainer) |
| 92 | 8 | Screw, drive (lube & identification) | 104 | 2 | Pin, dowel (manifold) |
| 93 | 1 | Plate, instruction (identification) | 105 | 9 | Screw, hex head (manifold) |
| 94 | 1 | Gauge, oil level | 106 | 4 | Screw, hex head (pump) |
| 95 | 1 | Tag, oil gauge (wired to gauge) | 107 | 4 | Screw, hex head (manifold) |
| 96 | 1 | Plug assembly | 108* | 1 | Elbow (pump outlet) |
| 97 | 1 | Tube assembly, oil gauge | 109 | 1 | Closure (pump outlet) |
| | consists of: | | 110 | 1 | Plug, pipe (manifold @ filter drain) |
| | 1 | Tube, oil gauge | 111 | 1 | Closure (manifold oil inlet) |
| | 1 | Adapter, threaded | 112 | 4 | Screw, hex head (ditch plate to manifold) |
| 98 | 4 | Plug, pipe (manifold come-home) | 113 | 1 | Plate, ditch |
| 99 | 1 | Plug, pipe (manifold) | 114 | 1 | Screw, hex head (manifold @ ditch plate) |
| 100 | 4 | Screw, hex head | 115 | 1 | Bushing, reducer (filler breather) |
| 101 | 3 | Plug, manifold | 116 | 1 | Breather |
| 102 | 1 | Plug, housing temperature sensor | | | |

**When two sets of dimensions are given, the first dimension is for English units, and the second dimension is for metric units.**

*** Denotes parts that may not be used on all models**

5202 CH13 transmission rear view.wpd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CAUTION
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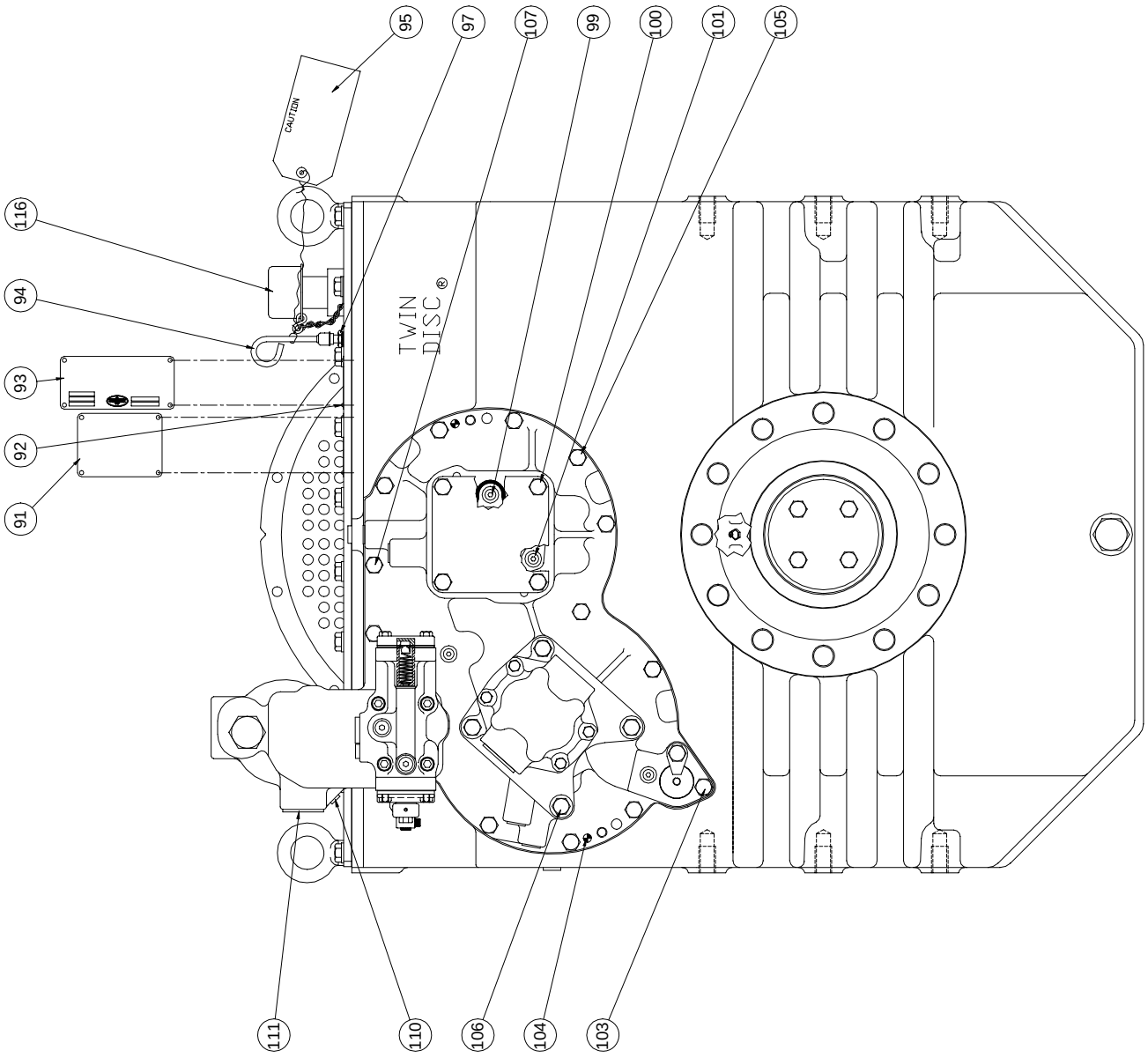
# MG5202 DC

| Item | Qty. | Description | Item | Qty. | Description |
|---|---|---|---|---|---|
| 91 | 1 | Plate, instruction (lube) | 100 | 4 | Screw, hex head (manifold cover plate) |
| 92 | 8 | Screw, drive (lube & identification) | 101 | 3 | Plug, manifold |
| 93 | 1 | Plate, instruction (identification) | 103 | 2 | Screw, hex head (manifold and strainer) |
| 94 | 1 | Gauge, oil level | 104 | 2 | Pin, dowel (manifold) |
| 95 | 1 | Tag, oil gauge (wired to gauge) | 105 | 9 | Screw, hex head (manifold) |
| 96 | 1 | Plug assembly | 106 | 4 | Screw, hex head (pump) |
| 97 | 1 | Tube assembly, oil gauge | 107 | 4 | Screw, hex head (manifold) |
| | consists of: | | 110 | 1 | Plug, pipe (manifold @ filter drain) |
| | 1 | Tube, oil gauge | 111 | 1 | Closure (manifold oil inlet) |
| | 1 | Adapter, threaded | 116 | 1 | Breather |
| 99 | 1 | Plug, pipe (manifold) | | | |

**When two sets of dimensions are given, the first dimension is for English units, and the second dimension is for metric units.**

*** Denotes parts that may not be used on all models**

5202 CH13 5202DC transmission rear view.wpd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CAUTION
TWIN DISC®

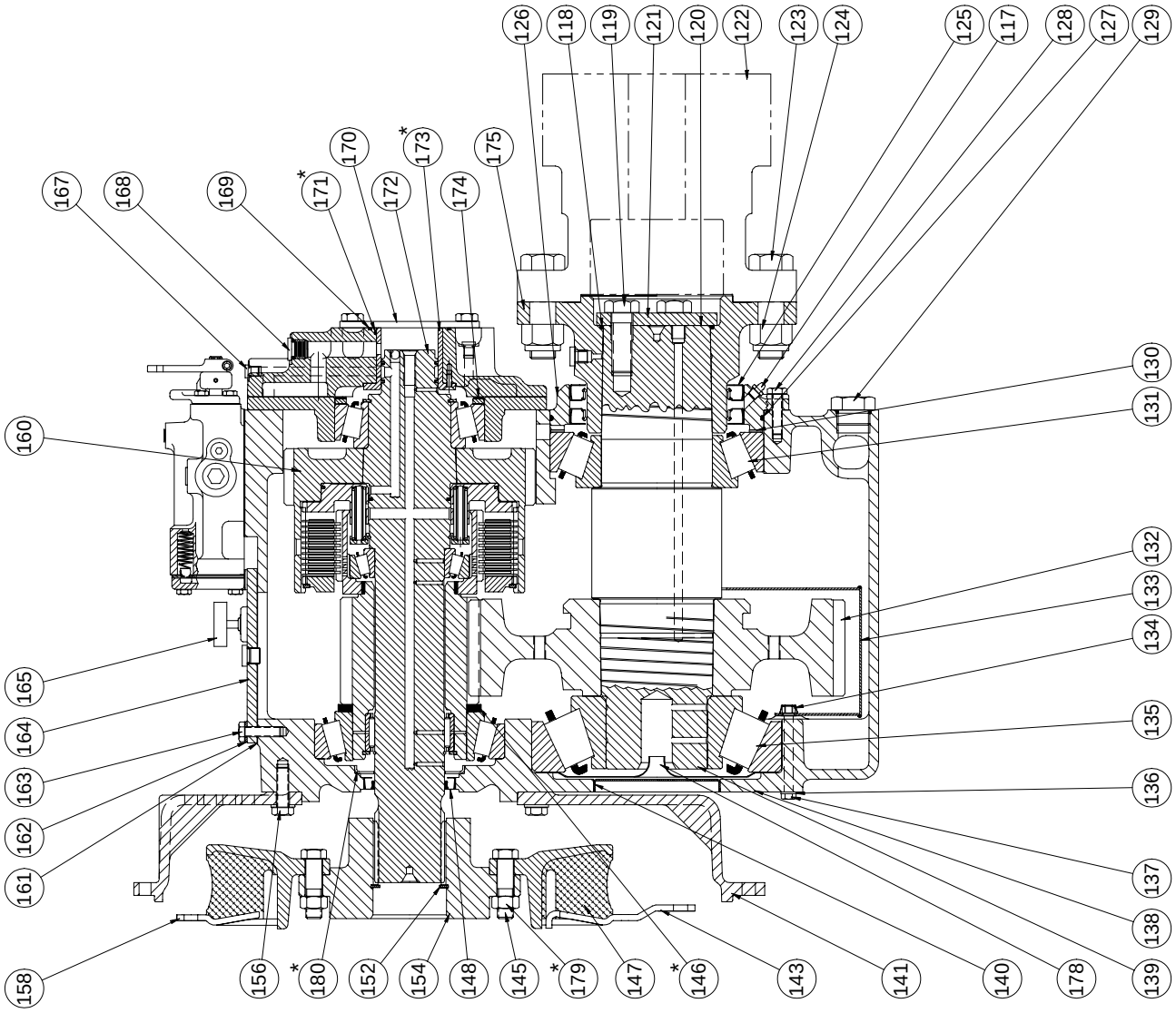
# MG5202 SC, MG5203 SC, MG5204 SC

| Item | Qty. | Description | Item | Qty. | Description |
|---|---|---|---|---|---|
| 117 | 1 | Fitting, grease (output seal carrier) | 149* | AR | Washer, flat (flexible coupling) |
| 118 | 1 | O-ring (output flange) | 150* | AR | Screw, hex head (flexible coupling) |
| 119 | 3 | Screw, hex head | 151* | 1 | Hub, adapter (flexible coupling) |
| 120 | AR | Shim, output flange retainer | 152 | 1 | Ring, retaining (internal) |
| 121 | 1 | Washer, retainer (output shaft) | 153* | 1 | Plug, expansion |
| 122 | 1 | Flange, companion | 154 | 1 | Hub, splined |
| 123 | 8 | Screw, hex head | 155* | 12 | Pin, dowel (flexible coupling) |
| 124 | 8 | Nut, lock | 156 | 12 | Screw, hex head (front housing to housing) |
| 125 | 2 | Seal, oil (output flange) | 157* | 8 | Screw, hex head (flexible coupling @ driving ring) |
| 126 | 1 | Carrier, output seal | 158* | 1 | Ring, driving (SAE #1 housing) |
| 127 | 1 | O-ring (output seal carrier) | 159* | AR | Nut (flexible coupling @ driving ring) |
| 128 | 6 | Screw, hex head (output seal carrier) | 160 | AR | Washer, flat (flexible coupling @ driving ring) |
| 129 | 1 | Plug assembly | 161 | 1 | Gasket, top cover |
| 130 | AR | Shim, rear bearing, output shaft | 162 | 16 | Washer, top cover |
| 131 | 1 | Bearing, tapered roller (output shaft rear bearing) | 163 | 16 | Screw, hex head (top cover) |
| 132 | 1 | Gear, output | 164 | 1 | Cover, housing top |
| 133 | 1 | Assembly, gear pan | 165 | 1 | Closure |
| 134 | 4 | Nut, caged (part of gear pan assembly above) | 166 | 1 | Gear, transfer (primary shaft) (RH helix) |
| 135 | 1 | Bearing, tapered roller (output shaft front bearing) | 167 | 2 | Plug assembly |
| 136 | 4 | Washer, seal (gear pan) | 168 | 2 | Plug assembly |
| 137 | 4 | Screw, hex head | 169 | 1 | O-ring (manifold @ cover) |
| 138 | 1 | Housing assembly | 170 | 1 | Cover (manifold @ primary shaft) |
| 139 | 1 | Shaft, output | 171* | 1 | O-ring (manifold bushing, primary shaft) |
| 140 | 1 | Plug, cup | 172 | 1 | Shaft assembly, primary |
| 141 | 1 | Housing, front | 173* | 1 | Bushing, manifold (primary shaft) |
| 142* | 1 | Ring, retaining (external) (output shaft front bearing) | 174 | AR | Shim, bearing (primary and secondary shaft rear bearing) |
| 143 | 1 | Ring, driving (SAE #0 housing) | | | |
| 144* | 8 | Washer, flat (flexible coupling @ driving ring) | 175 | 1 | Flange, output |
| 145* | AR | Screw, hex head (flexible coupling @ driving ring) | 178 | 1 | Shield, oil distribution |
| 146* | 2 | Spacer, bearing (pinion front bearing) | 179* | AR | Nut (flexible coupling @ driving ring) |
| 147 | 2 | Coupling, flexible | 180* | 1 | Plug, core (behind oil seal) |
| 148 | 1 | Seal, oil (primary shaft @ coupling hub) | | | |

**When two sets of dimensions are given, the first dimension is for English units, and the second dimension is for metric units.**

*** Denotes parts that may not be used on all models**

5202CH13 section view.wpd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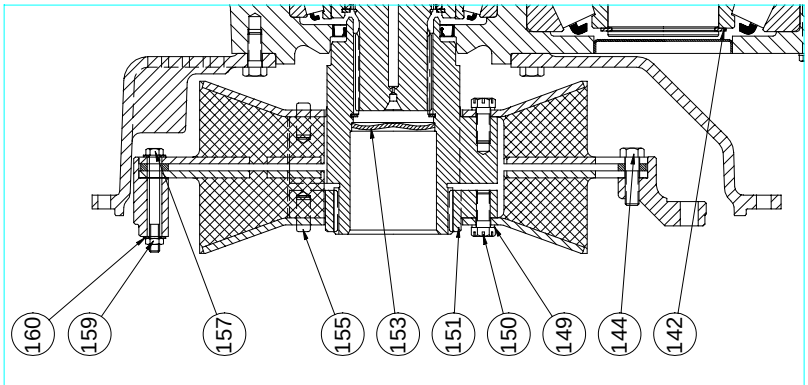
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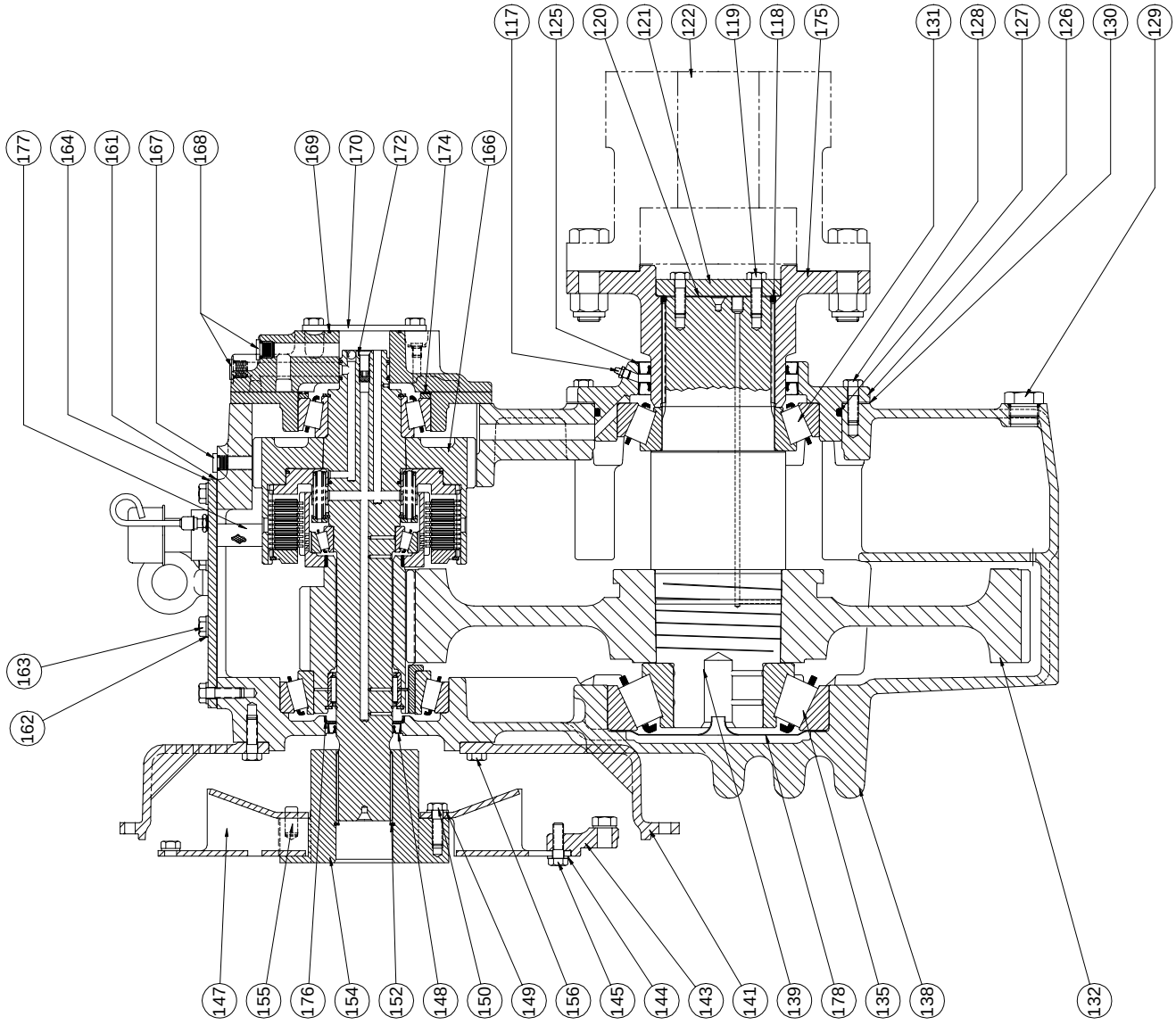
# MG5202 DC

| Item | Qty. | Description | Item | Qty. | Description |
|---|---|---|---|---|---|
| 117 | 1 | Fitting, grease (output seal carrier) | 149 | AR | Washer, flat (flexible coupling) |
| 118 | 1 | O-ring (output flange) | 150 | AR | Screw, hex head (flexible coupling) |
| 119 | AR | Screw, hex head (output flange) | 152 | 1 | Ring, retaining (internal) |
| 120 | AR | Shim, output flange retainer | 154 | 1 | Hub, splined |
| 121 | 1 | Washer, retainer (output shaft) | 155 | 12 | Pin, dowel (flexible coupling) |
| 122 | 1 | Flange, companion | 156 | 8 | Screw, hex head (front housing to housing) |
| 125 | 2 | Seal, oil (output flange) | 161 | 1 | Gasket, top cover |
| 126 | 1 | Carrier, output seal | 162 | 24 | Washer, top cover |
| 127 | 1 | O-ring (output seal carrier) | 163 | 24 | Screw, hex head (top cover) |
| 128 | 8 | Screw, hex head (output seal carrier) | 164 | 1 | Cover, housing top |
| 129 | 1 | Plug assembly | 166 | 1 | Gear, transfer (primary shaft) (RH helix) |
| 130 | AR | Shim, rear bearing, output shaft | 167 | 2 | Plug assembly |
| 131 | 1 | Bearing, tapered roller (output shaft rear bearing) | 168 | 4 | Plug assembly |
| 132 | 1 | Gear, output | 169 | 1 | O-ring (manifold @ cover) |
| 135 | 1 | Bearing, tapered roller (output shaft front bearing) | 170 | 1 | Cover (manifold @ primary shaft) |
| 138 | 1 | Housing assembly | 172 | 1 | Shaft assembly, primary |
| 139 | 1 | Shaft, output | 174 | AR | Shim, bearing (primary and secondary shaft rear bearing) |
| 141 | 1 | Housing, front | | | |
| 143 | 1 | Ring, driving (SAE #0 housing) | 175 | 1 | Flange, output |
| 144 | 8 | Washer, flat (flexible coupling @ driving ring) | 176 | 1 | Plug, core (behind oil seal) |
| 145 | 8 | Screw, hex head (flexible coupling @ driving ring) | 177 | 1 | Screen, strainer |
| 147 | 2 | Coupling, flexible | 178 | 1 | Shield, oil distribution |
| 148 | 1 | Seal, oil (primary shaft @ coupling hub) | | | |

**When two sets of dimensions are given, the first dimension is for English units, and the second dimension is for metric units.**

*** Denotes parts that may not be used on all models**

5202 CH13 DC section view.wpd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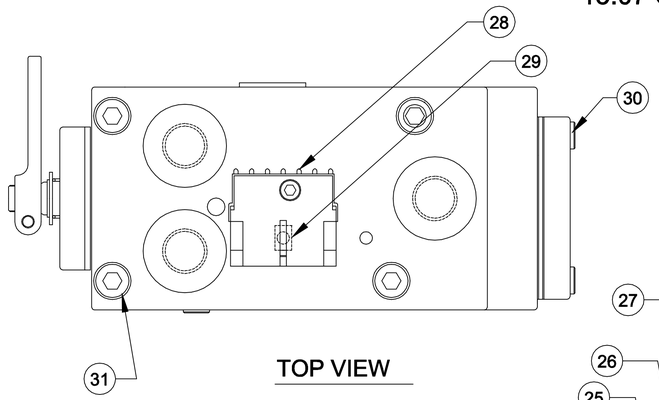
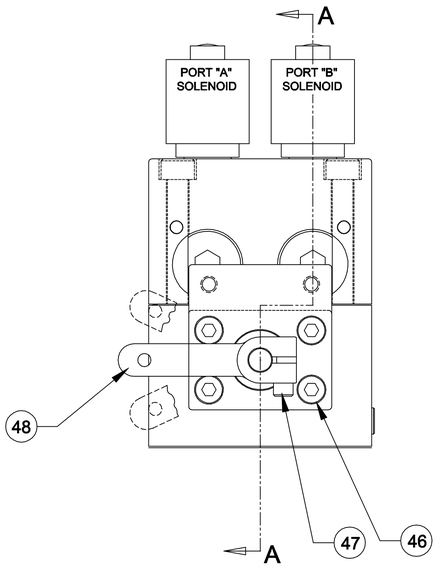
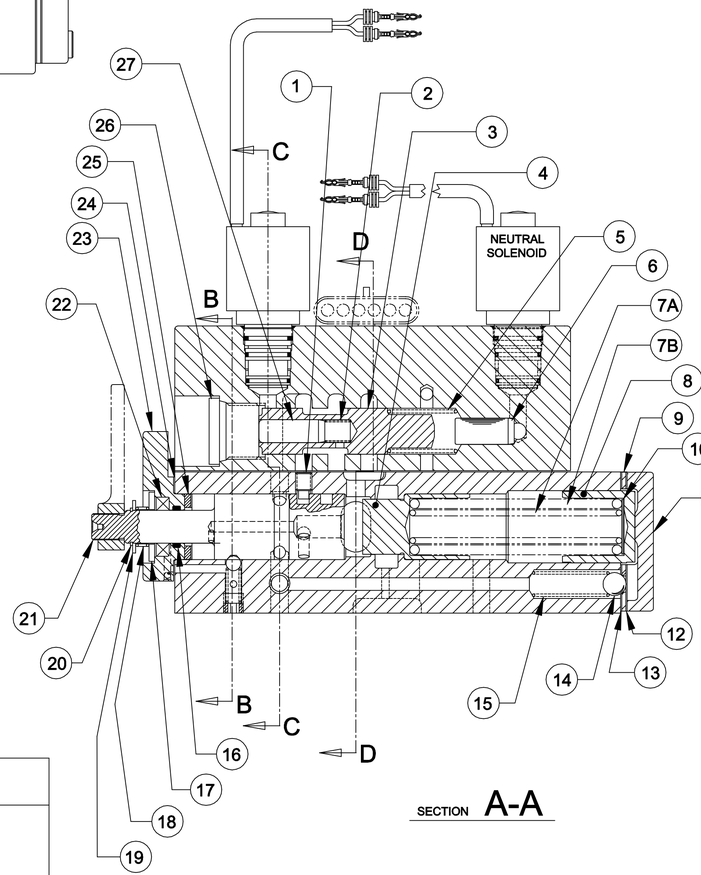
# 13.07 CONTROL VALVE GROUP

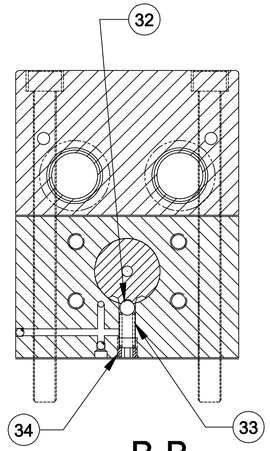



TOP VIEW

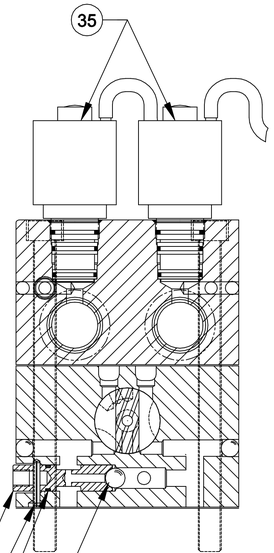


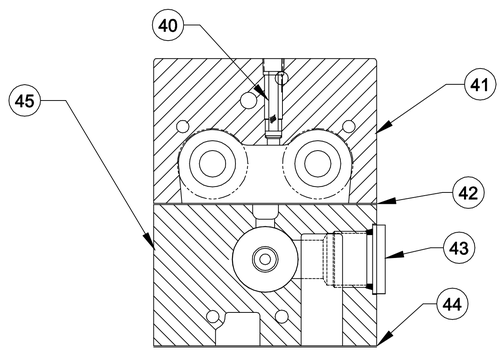

SECTION A-A




SECTION B-B

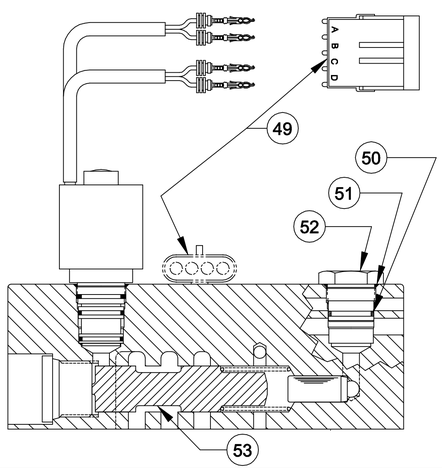



SECTION C-C



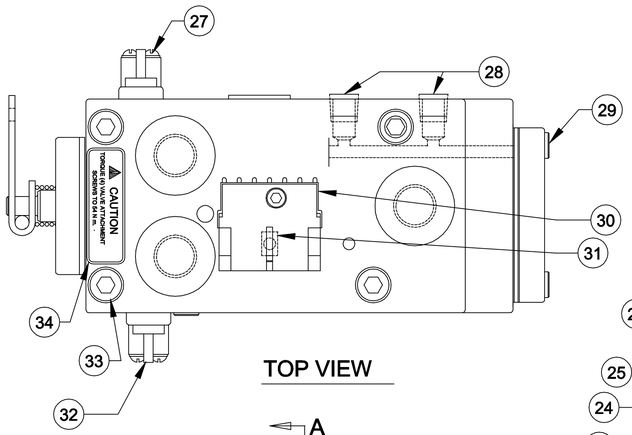

SECTION D-D

PARTS FOR UNITS WITHOUT NEUTRAL SOLENOID AND HYDRAULIC LOCK (OPTIONAL CONDITION)

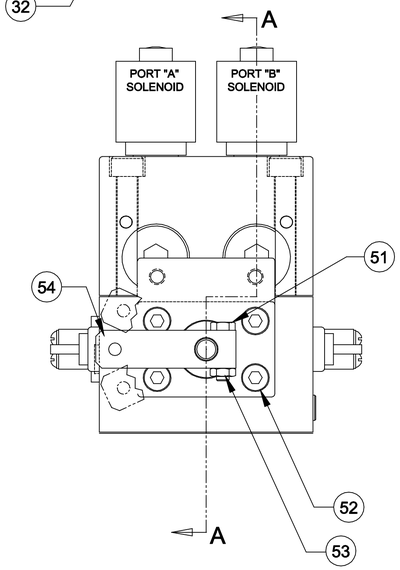


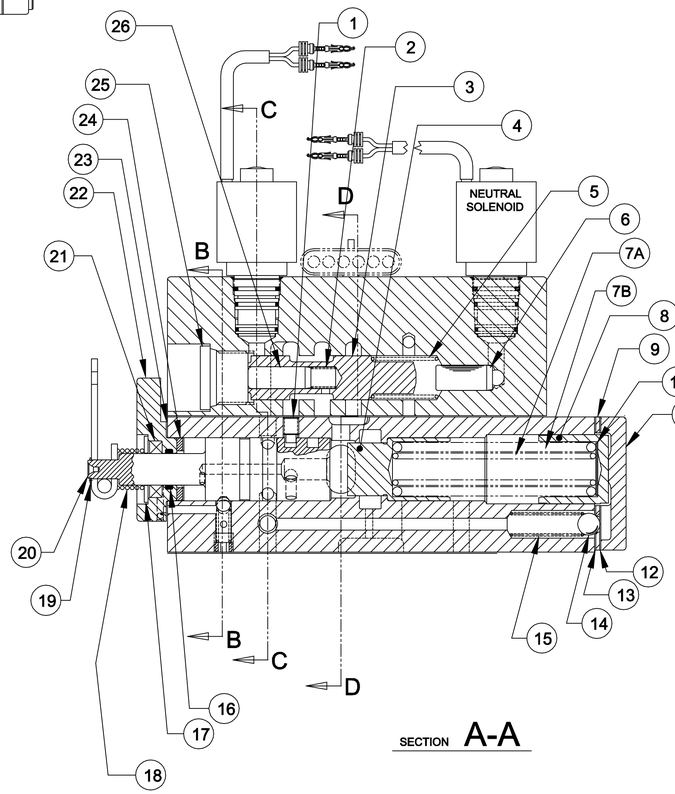

| ITEM | N A M E | Q'TY | REMARKS |
|---|---|---|---|
| 1 | SETSCREW | 1 | DOG POINT |
| 2 | SPRING | 2 | UNITS WITH HYD. LOCK |
| 3 | SPOOL | 2 | UNITS WITH HYD. LOCK |
| 4 | PISTON | 1 | |
| 5 | SPRING | 2 | |
| 6 | PIN | 2 | |
| 7a | SPRING | 1 | INNER (PRESS. REGULATING) |
| 7b | SPRING | 1 | OUTER (PRESS. REGULATING) |
| 8 | PISTON | 1 | |
| 9 | PLATE, ORIFICE | 1 | |
| 10 | SHIM | AS REQ'D | |
| 11 | COVER | 1 | |
| 12 | GASKET | 1 | COVER |
| 13 | GASKET | 1 | ORIFICE PLATE |
| 14 | BALL | 1 | |
| 15 | SPRING | 1 | NEUTRAL PRESS. REGULATING |
| 16 | "O" RING | 1 | |
| 17 | WASHER | 2 | |
| 18 | SPRING | 1 | |
| 19 | WASHER | 1 | |
| 20 | RING, SNAP | 1 | |
| 21 | STEM | 1 | |
| 22 | SEAL | 1 | |
| 23 | COVER | 1 | |
| 24 | GASKET | 1 | |
| 25 | WASHER | 1 | |
| 26 | PLUG ASSEMBLY | 2 | |
| 27 | PIN | 2 | UNITS WITH HYD. LOCK |
| 28 | CONNECTOR, SHROUD | 1 | UNITS WITH HYD. LOCK |
| 29 | CLIP, CONNECTOR | 1 | |
| 30 | SCREW | 4 | SOCKET HEAD |
| 31 | SCREW | 4 | SOCKET HEAD |
| 32 | BALL | 1 | |
| 33 | SPRING | 1 | DETENT |
| 34 | SETSCREW | 1 | |
| 35 | SOLENOID | 2 | 3 REQ'D. FOR UNITS WITH HYD. LOCK |
| 36 | BALL | 1 | SHUTTLE |
| 37 | "O"RING | 1 | |
| 38 | PIN | 1 | |
| 39 | SEAT | 1 | |
| 40 | SCREEN | 1 | |
| 41 | VALVE BODY | 1 | |
| 42 | GASKET | 1 | VALVE BODY HALF |
| 43 | PLUG ASSEMBLY | 1 | SOME MODELS |
| 44 | GASKET | 1 | |
| 45 | VALVE BODY | 1 | |
| 46 | SCREW | 4 | SOCKET HEAD |
| 47 | SCREW | 1 | SOCKET HEAD |
| 48 | LEVER | 1 | |
| 49 | CONNECTOR, SHROUD | 1 | UNITS WITHOUT HYD. LOCK |
| 50 | "O" RING | 1 | UNITS WITHOUT HYD. LOCK |
| 51 | "O" RING | 1 | UNITS WITHOUT HYD. LOCK |
| 52 | PLUG | 1 | UNITS WITHOUT HYD. LOCK |
| 53 | SPOOL | 2 | UNITS WITHOUT HYD. LOCK |

# 13.08 CONTROL VALVE GROUP

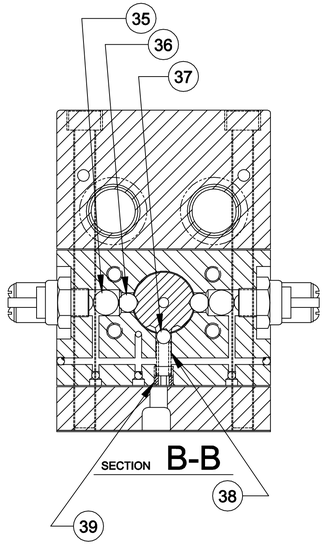


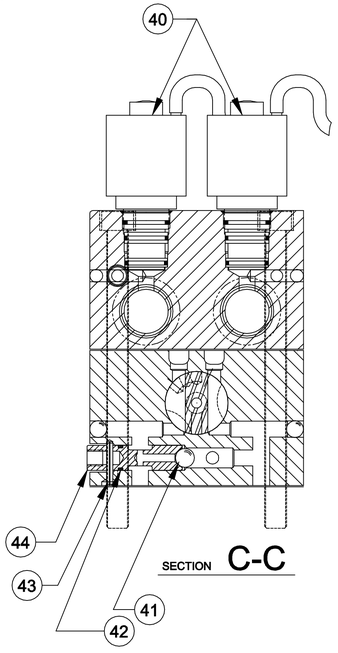

TOP VIEW



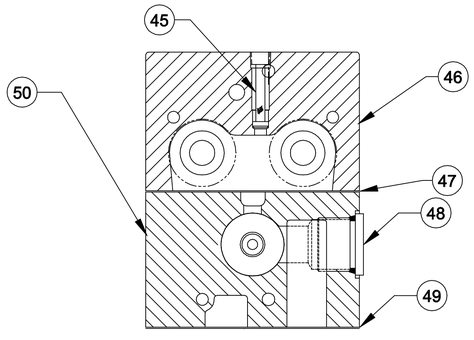




SECTION A-A



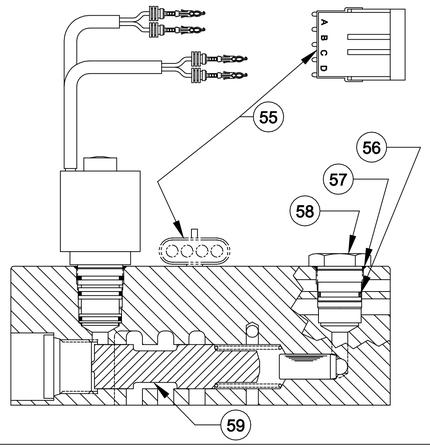




SECTION C-C

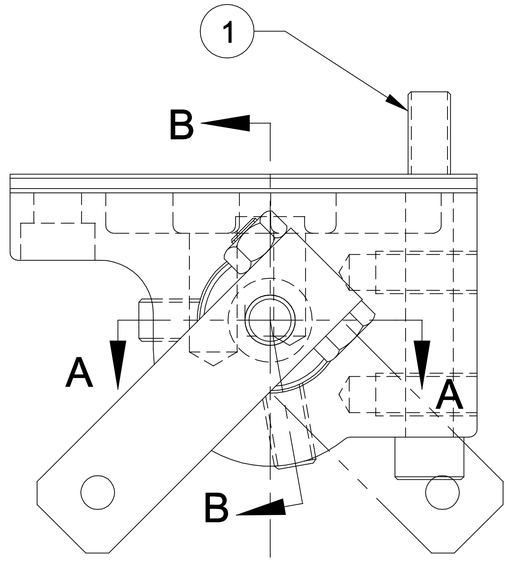


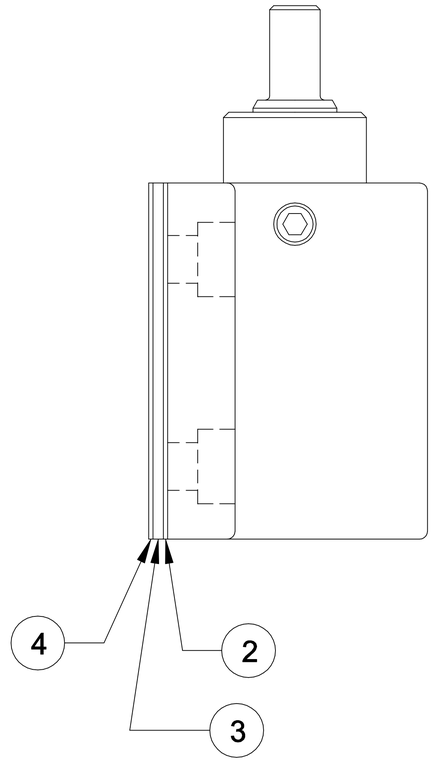

SECTION D-D

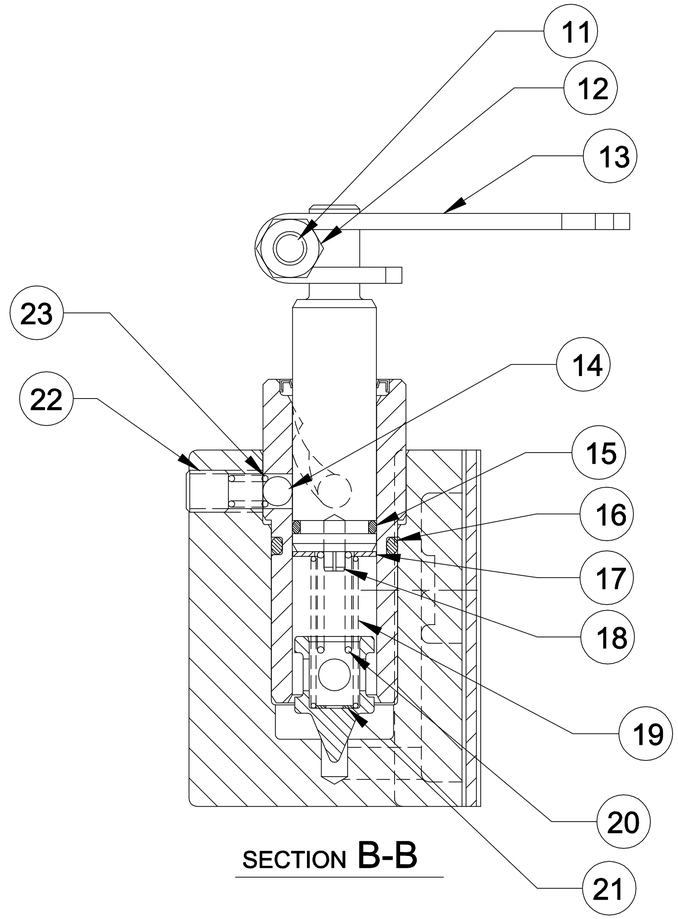
PARTS FOR UNITS WITHOUT NEUTRAL SOLENOID AND HYDRAULIC LOCK (OPTIONAL CONDITION)



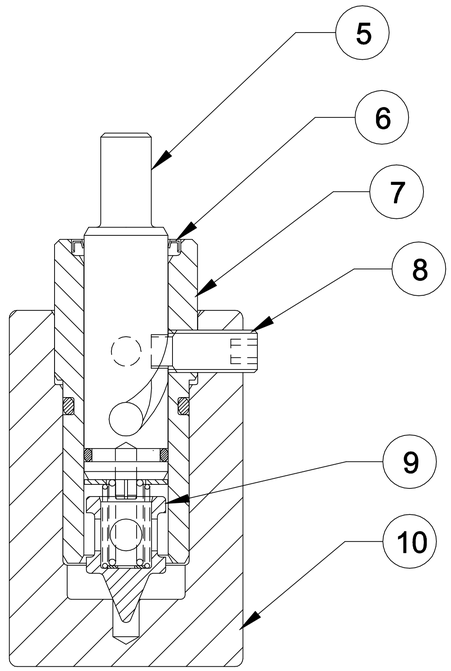

| ITEM | NAME | Q'TY | REMARKS |
|---|---|---|---|
| 1 | SETSCREW | 1 | DOG POINT |
| 2 | SPRING | 2 | UNITS WITH HYD. LOCK |
| 3 | SPOOL | 2 | UNITS WITH HYD. LOCK |
| 4 | PISTON | 1 | |
| 5 | SPRING | 2 | |
| 6 | PIN | 2 | |
| 7a | SPRING | 1 | INNER (PRESS. REGULATING) |
| 7b | SPRING | 1 | OUTER (PRESS. REGULATING) |
| 8 | PISTON | 1 | |
| 9 | PLATE, ORIFICE | 1 | |
| 10 | SHIM | AS REQ'D | |
| 11 | COVER | 1 | |
| 12 | GASKET | 1 | COVER |
| 13 | GASKET | 1 | ORIFICE PLATE |
| 14 | BALL | 1 | |
| 15 | SPRING | 1 | NEUTRAL PRESS. REGULATING |
| 16 | "O" RING | 1 | |
| 17 | WASHER | 1 | |
| 18 | SPRING | 1 | |
| 19 | RING, SNAP | 1 | |
| 20 | STEM | 1 | |
| 21 | SEAL | 1 | |
| 22 | COVER | 1 | |
| 23 | GASKET | 1 | |
| 24 | WASHER | 1 | |
| 25 | PLUG ASSEMBLY | 2 | |
| 26 | PIN | 2 | UNITS WITH HYD. LOCK |
| 27 | SWITCH | 1 | MANUAL OVERRIDE NEUTRAL START |
| 28 | PLUG | 2 | MAIN PRESSURE PORTS |
| 29 | SCREW | 4 | SOCKET HEAD |
| 30 | CONNECTOR, SHROUD | 1 | UNITS WITH HYD. LOCK |
| 31 | CLIP, CONNECTOR | 1 | |
| 32 | SWITCH | 1 | ELECTRIC CONTROL MODE |
| 33 | SCREW | 4 | SOCKET HEAD |
| 34 | PLATE | 1 | CAUTION |
| 35 | BALL | 2 | LARGE DIA. |
| 36 | BALL | 2 | SMALL DIA. |
| 37 | BALL | 1 | |
| 38 | SPRING | 1 | DETENT |
| 39 | SETSCREW | 1 | |
| 40 | SOLENOID | 2 | 3 REQ'D. FOR UNITS WITH HYD. LOCK |
| 41 | BALL | 1 | SHUTTLE |
| 42 | "O"RING | 1 | |
| 43 | PIN | 1 | |
| 44 | SEAT | 1 | |
| 45 | SCREEN | 1 | |
| 46 | VALVE BODY | 1 | |
| 47 | GASKET | 1 | VALVE BODY HALF |
| 48 | PLUG ASSEMBLY | 1 | SOME MODELS |
| 49 | GASKET | 1 | |
| 50 | VALVE BODY | 1 | |
| 51 | SCREW | 1 | HEX. HEAD |
| 52 | SCREW | 4 | SOCKET HEAD |
| 53 | NUT | 1 | |
| 54 | LEVER | 1 | |
| 55 | CONNECTOR, SHROUD | 1 | UNITS WITHOUT HYD. LOCK |
| 56 | "O" RING | 1 | UNITS WITHOUT HYD. LOCK |
| 57 | "O" RING | 1 | UNITS WITHOUT HYD. LOCK |
| 58 | PLUG | 1 | UNITS WITHOUT HYD. LOCK |
| 59 | SPOOL | 2 | UNITS WITHOUT HYD. LOCK |




SECTION B-B




SECTION A-A

# 13.09 TROLLING VALVE GROUP

| ITEM | N A M E | Q'TY | REMARKS |
|---|---|---|---|
| 1 | SCREW | 2 | SOCKET HEAD |
| 2 | GASKET | 1 | BODY |
| 3 | PLATE, ORIFICE | 1 | |
| 4 | GASKET | 1 | PLATE |
| 5 | STEM | 1 | |
| 6 | SEAL | 1 | |
| 7 | ADAPTER | 1 | |
| 8 | SETSCREW | 1 | DOG POINT |
| 9 | PISTON | 1 | |
| 10 | VALVE BODY | 1 | |
| 11 | SCREW | 1 | HEX. HEAD |
| 12 | NUT | 1 | |
| 13 | LEVER | 1 | |
| 14 | BALL | 1 | |
| 15 | "O" RING | 1 | |
| 16 | "O" RING | 1 | |
| 17 | WASHER | 1 | |
| 18 | PIN | 1 | |
| 19 | SPRING | 1 | OUTER |
| 20 | SPRING | 1 | INNER |
| 21 | WASHER | 1 | |
| 22 | SETSCREW | 1 | |
| 23 | SPRING | 1 | DETENT |

Section 14

# Engineering Drawings

## MG5202SC, MG5203SC, MG5204SC, and MG5202DC transmissions

NOTE: foldout drawings appear after this page in the order listed below:


**14.1 1014841 MG5202SC**

**14.2 1015389 MG5202SC**

**14.3 1016103 MG5202SC**

**14.4 1016249 MG5203SC**

**14.5 1016250 & 1016250A MG5204SC**

**14.6 1015207 MG5202DC**

**14.7 1015207A MG5202DC**

**14.8 A7119R Hydraulic Diagram**

**14.9 A7119Q Hydraulic Diagram**

**14.10 A7119W Hydraulic Diagram**

**14.11 A7119Y Hydraulic Diagram**

**14.12 XA7371 Control Valve**

**14.13 XA7372 Control Valve with Trolling**

**14.14 XA7540 Control Valve**

**14.15 XA7600 Control Valve with Trolling**

**14.16 1017172 Control Valve**

**14.17 1017555 Trolling Valve**

**14.18 1018084 Control Valve**


**list continued on page 14-2 ...**

**14.19 1018440 Control Valve with Trolling**

**14.20 1017177 Live PTO**

**14.21 1017820 Clutchable PTO**

**14.22 1016473 Electric Trailing Pump (remote mounted)**

## ASSEMBLY INSTRUCTIONS:

ASSEMBLE AND TEST PER S570AE.
NOTES #1 THRU #8 ARE IN S570AE.

## THESE STANDARDS APPLY:

S574 FASTENER TORQUE REQUIREMENTS
S692 BEARING SHIMMING
S765 TAPERED JOINT ASSEMBLY
S774 ANAERDBIC SEALANT APPLICATION

| | |
|---|---|
| MA217H | 2 |
| B1048BB | 2 |
| M2693P | 2 |
| 1015361 | 1 |
| ✱ 1015360 | 1 |
| MA1034B STEEL BALL | 1 |
| 1015108 THIS SPACER USED WITH 1014905 ONLY | 2 |
| M2795 | 2 |
| M2943 THIS BEARING USED WITH 1016333 ONLY | 2 |

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| | |
|---|---|
| 1014857 | 2 |
| 1001380 | 1 |
| B6231 | 2 |
| A2669AU | 2 |
| 1001118 | 1 |

Ⓝ

| | |
|---|---|
| 206107B | 20 |
| 206106P | 22 |
| B3616A | 2 |
| M2693E | 2 |

| | |
|---|---|
| XA2703BD | 32 |
| A2701BG | 1 |
| A2703BD | 1 |
| B6232 | 2 |

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| | |
|---|---|
| 203190B | 2 |
| M1904DA | 2 |
| MA929 | 1 |
| A2706AC | 1 |
| M1990Q | 1 |
| MA960E | 2 |
| MA1039A | 2 |
| 1014856 | 2 |

Ⓛ

| | |
|---|---|
| 1002093 | 2 |
| 1002091 | 1 |
| MA1036A ROLL PIN | 2 |
| A2915CK | 2 |

✱

| | |
|---|---|
| M1904AQ | 4 |
| MA1037B | 2 |

REPLACED BY / OBSOLETE

| REPLACED BY | OBSOLETE | | |
|---|---|---|---|
| 1016333 | 1014905 | 2 | |
| | 3.48:1 RATIO | 21 T | |
| 1016330 | 1014962 | 2 | |
| | 2.92:1 RATIO | 24 T | |
| 1016328 | 1014902 | 2 | |
| | 2.48:1 RATIO | 27 T | |
| 1016324 | 1014899 | 2 | |
| | 2.03:1 RATIO | 31 T | |
| 1016322 | 1014896 | 2 | |
| | 1.76:1 RATIO | 33 T | |
| 1016320 | 1014893 | 2 | |
| | 1.53:1 RATIO | 36 T | |
| 1016318 | 1014890 | 2 | |
| | 1.17:1 RATIO | 42 T | |

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REPLACEMENT PINIONS DO NOT REQUIRE SPACERS 1014854 AND 1015108.

| | |
|---|---|
| 1001349 | 1 |
| 1001218 | 1 |
| 1015355 | 1 |

| | |
|---|---|
| 1018462 | 1 |
| 1015110 | 1 |

Ⓧ

| | |
|---|---|
| 1001116 | 1 |
| 1015363 | 1 |

| | |
|---|---|
| A2703P | 1 |
| M1990H | 1 |
| B139BE | 2 |
| 1014863 | 1 |
| ✱ 1014862 | 1 |
| MA977 | 1 |
| 1015109 | 1 |
| MA1039E | 16 |
| MA961A | 16 |

Ⓜ Ⓠ

| | |
|---|---|
| MA1038A | 2 |
| MA1038D | 2 |
| 202347 | 1 |
| A2916JZ | 1 |

| | |
|---|---|
| 1015359 | 1 |
| 1015358 | 1 ✱ |
| MA1034B STEEL BALL | 1 |

SEE NOTE #6

| | |
|---|---|
| 1014883 | AS REQ'D. |
| 1014884 | |
| 1014885 | |

SEE NOTE #6

| | |
|---|---|
| M268 | 1 |
| 1014855 | 1 |
| A2916BK | 1 |
| B2422 | 1 |
| B2422A | AS REQ'D. |
| B2422B | |

SEE NOTE #7

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| | |
|---|---|
| M2027R | 8 |
| M2048G | 16 |
| 1014843 | 1 |
| 1014853 | 1 |
| M2002BW | 8 |

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| | |
|---|---|
| A2711P | 12 |
| MA996D | 12 |
| 1015345 | 1 |
| ✱ 1015344 | 1 |
| M1841B | 1 |
| B1048C | 1 |
| M2326 | 1 |

| | |
|---|---|
| 1015343 | 1 |
| MA996D | 8 |
| MA1039B | 8 |
| 1002557 | 2 |
| 1014854 | 2 |

| | |
|---|---|
| MA996F | 8 |
| 1014906 | 1 |
| A2888CV | 8 |
| 1014887 | 1 |

| | |
|---|---|
| 1015364 | 1 |
| M1945T | 1 |
| A2915CJ | 1 |
| 1015352 | 1 |

| | | | | |
|---|---|---|---|---|
| MA960J | 4 | | | |
| M2081D | 4 | | | |
| 1015347 | 1 | | | |
| 1015346 | 1 | | | |
| MA1054A | 4 | | | |

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| | | | | |
|---|---|---|---|---|
| 1014858 | 1 | | | |
| 1014842 | 1 | | | |
| 3.48:1 RATIO | 73 T | | | |
| 1014903 | 1 | | | |
| 2.92:1 RATIO | 70 T | | | |
| 1014900 | 1 | | | |
| 2.48:1 RATIO | 67 T | | | |
| 1014897 | 1 | | | |
| 2.03:1 RATIO | 63 T | | | |
| 1014894 | 1 | | | |
| 1.76:1 RATIO | 58 T | | | |
| 1014891 | 1 | | | |
| 1.53:1 RATIO | 55 T | | | |
| 1014888 | 1 | | | |
| 1.17:1 RATIO | 49 T | | | |

| | | | | |
|---|---|---|---|---|
| 1014859 | 1 | AS REQ'D. | | |
| 1014880 | | | | |
| 1014881 | | | | |
| 1014882 | | | | |
| MA1040B | 1 | | | |

| | | | | |
|---|---|---|---|---|
| 1015146 | 1 | 6 | 1 | 2 |
| MA961C | | | | |
| A2916FW | | | | |
| M2183 | | | | |

Ⓐ

SEE NOTE #6

| | |
|---|---|
| A2916JT | 1 |
| B2502 | 1 |
| 212754 | 1 |
| B2130B | 1 |

SUCTION SCREEN

REMOVE NUT M2027R BEFORE INSTALLATION TO FLYWHEEL

Ⓣ

S.A.E. #1 HOUSING

S.A.E. #10 HOUSING

SEE NOTE #1
SEE NOTE #2
SEE NOTE #3
SEE NOTE #4
SEE NOTES #1 & #5
SEE NOTE #6
SEE NOTE #7
SEE NOTE #8
SEE NOTE "A"

XA7540A
CONTROL VALVE ASSEMBLY

| | |
|---|---|
| MA1038B | 3 |
| 204087B | 1 |
| A2702BP | 1 |
| 2039 | 1 |
| B1334A | 1 |
| M1990E | 1 |
| MA960A | 4 |
| PM2306D | 1 |
| B1867 | 1 |
| M1927B | 1 |
| B3574C | 1 |
| 1014883 | AS REQ'D. |
| 1014884 | |
| 1014885 | |

Ⓜ SEE NOTE #6

OIL PRESSURE GAGE

| | |
|---|---|
| B1703D PRESSURE GAUGE | 1 |
| MA1038E | 1 |
| 1001138 | 1 |
| MA1052B | 2 |
| MA1052B | 2 |
| M2067X PLASTIC CLOSURE | 4 |
| B1397D | 1 |
| B1399C | 1 |
| B2334 | AS REQ'D |
| B1333D | 1 |
| MA960A | 4 |

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| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MA778 | 1 | A2916AT | 1 | M2087K | 1 | M2086AV | 2 | A4347J | 1 | B1400B | 1 | XB36148 | 1 | B3614B | 1 | MA950B LABEL | 1 |
| B3646A | 1 | B1337F MTG GASKET | 1 | XA2707AX | 1 | A2707AX | 1 | A2704BU | 1 | M1731CP | 1 | B1048H | 1 | 1003279 | 1 | 1003436 | 1 |
| A2518A | 1 | M2027F | 2 | | | | | | | | | | | | | | |

SET SPRING LENGTH TO 30.2 mm

FILTER BY-PASS

| | |
|---|---|
| 1003738 | 1 |
| M2280 | 1 |
| M2052CD | 1 |
| MA961M | 1 |
| 1014872 | 1 |
| MA961H | 4 |
| ▲ M2702F | 1 |
| MA1038A | 2 |

| | |
|---|---|
| ▲ M2702F | 1 |
| MA961K | 4 |
| MA996F | 4 |
| MA961J | 9 |
| MA1035A | 2 |

| | |
|---|---|
| MA961L | 2 |
| MA1038A | 1 |
| MA1055A | 3 |
| B1504GE | 1 |

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OPTIONAL EXTRA-SUPPLIED ONLY WHEN SO SPECIFIED

| | |
|---|---|
| 1015378 | 1 |
| 1015119 | 1 |
| MA1046A | 8 |
| MA1048A | 8 |

MOUNT LUBE INSTRUCTION PLATE WITH WORDS "MARINE TRANSMISSION LUBRICANT" TOWARDS BREATHER.

MOUNT INSTRUCTION PLATE WITH WORDS "MARINE TRANSMISSION" TOWARDS BREATHER.

SEE NOTE "B"

ENGINE

CAUTION

| | |
|---|---|
| B2415 | 1 |
| M422B | 8 |
| 204098C | 1 |
| B3631G | 1 |
| MA656C | 1 |

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| | |
|---|---|
| XB2301H | 1 |
| B2301H | 1 |
| B2300 | 1 |

| | |
|---|---|
| MA1038C | 1 |

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| | |
|---|---|
| MA1038A | 1 |
| MA996E | 4 |
| MA1038A | 3 |

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### CUSTOMER NOTES:

a.) OIL CAPACITY 26.5 L (7 GALS.), LESS HOSES AND HEAT EXCHANGER.

b.) THIS UNIT CAN NOT BE USED WITH LEFT HAND ENGINE.

c.) OPTIONAL EQUIPMENT:
COMPANION FLANGE ASSEMBLY: 1015378
CONTROL TROLLING VALVE: XA7600A
LIVE P.T.O.: XB6243A (AUXILIARY PUMP DRIVE) Ⓟ
HYDRAULIC CLUTCHED P.T.O.: XA7554 (SHAFT DRIVE) AND XA7554A (PUMP DRIVE).
TRAILING PUMP: 1016473 Ⓥ
FLEXIBLE COUPLING INPUTS-SEE SHEET 3. Ⓓ
K BOM NO. 1096 (METRIC TO NPTF ADAPTER KIT)

OIL TEMPERATURE INDICATING SWITCH: B3424, FOR INSTALLATION LOCATION, SEE HYDRAULIC DIAGRAM AND SHEET 2.

✱ NOT SERVICEABLE SEPARATELY.

▲ REMOVE BEFORE OPERATING, 2 PLACES, THREAD PROTECTORS.

OBSOLETE
FOR PRODUCTION
REPLACED BY 1016103

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● = THIS INFORMATION TO BE ADDED WHEN IT BECOMES AVAILABLE.

MAX. INPUT SPEED: 2500 R.P.M.
CONSULT SALES DEPT. APPLICATION ENGINEERS FOR OTHER LIMITING CONDITIONS.

| | |
|---|---|
| SHEET 1 OF 3 | CROSS SECTIONS AND PART NUMBERS |
| SHEET 2 OF 3 | INSTALLATION DRAWING |
| SHEET 3 OF 3 | FLEXIBLE COUPLING INPUTS |
| B3504AE | MASS ELASTIC SYSTEM |
| B3649K | HEAT EXCHANGER REQUIREMENTS |
| A7119Q | HYDRAULIC DIAGRAM |

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METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2 | S | | 27632 | 3-13-97 |
| 1 | X | C4 | 28657 | 7-21-98 | 1 | R | C3 | 27354 | 10-22-96 |
| 1 | W | E1 | 28544 | 5-4-98 | 1 | Q | D4 | 27113 | 6-12-96 |
| ALL | V | | 28247 | 12-15-97 | SHTS 1,2,3 | P | | 27030 | 5-7-96 |
| 1-6 | U | A1 | 27790 | 6-5-97 | | N | B-6 | 26826 | 2-15-96 |
| 1&3 | T | | 27750 | 4-30-97 | | M | C-6 D-6 | 26820 | 2-14-96 |
| SHT.NO. | REV | ZONE | CH. NO. | DATE | SHT.NO. | REV | ZONE | CH. NO. | DATE |

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MATERIAL — GEAR RATIOS: 1.17:1 2.03:1 3.48:1; 1.53:1 2.48:1; 1.76:1 2.92:1
WEIGHT — KG — WR² — N.m²
HEAT TREAT
FIRST USE
ASSY.
MODEL
SURFACE TREATMENT
NAME Ⓐ MG5202(SC) MARINE TRANSMISSION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS X ±0.75, X.X ±0.25, X.XX ±0.13
ALL ANGULAR TOLERANCES AND GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 3-25-93
SCALE .50=1.00
DRN. KS
CHK. JS
APP'D. TBC

TWIN DISC INCORPORATED RACINE, WI 53403 - USA

1014841 Ⓑ

SHEET 1 OF 4 Ⓓ REV X

E D C B A

6 5 4 3 2 1

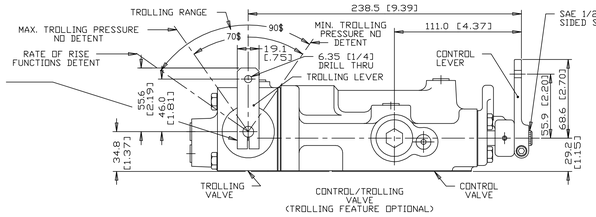
(OPTIONAL) TROLLING VALVE INSTALLATION AND OPERATING NOTES:

1) REFER TO VALVE ASSEMBLY DRAWING FOR ADDITIONAL INSTALLATION NOTES. CONTROL HEAD FOR TROLLING VALVE MUST INCLUDE A DEVICE TO LOCK TROLLING VALVE CONTROL LEVER IN THE DETENTED NO-TROLL POSITION DURING MANEUVERING, DOCKING AND OTHER OPERATING CONDITIONS THAT REQUIRE FULL POWER TO THE PROPELLER.

2) MAXIMUM ENGINE SPEED WHILE TROLLING 1100 RPM OR 60% OF FULL-LOAD ENGINE SPEED, WHICHEVER IS SMALLER.

3) WITH CONTROL VALVE LEVER IN NEUTRAL, SELECT TROLLING FUUCTION BY MOVING TROLLING CONTROL LEVER OUT OF LOCKED DETENTED POSITION TO MAXIMUM TROLLING POSITION. SELECT TROLLING DIRECTION OF TRAVEL BY MOVING CONTROL VALVE LEVER TO THE PRIMARY CLUTCH OR SECONDARY CLUTCH POSITION. MOVE TROLLING CONTROL LEVER FROM MINIMUM TROLLING POSITION TO SELECT DESIRED TROLLING SPEED. WHEN TROLLING LEVER IS ADVANCED CLOSE TO DETENTED NO-TROLL POSITION, THE TROLLING CLUTCH MAY ENGAGE FULLY.

THE TROLLING LEVER ANGULAR LOCATION MAY BE ADJUSTED SO THAT THE 90$ LEVER ROTATION REQUIRED FOR CONTROL FALLS ANYWHERE WITHIN THE 360$ RANGE IN WHICH THE LEVER MAY BE LOCATED.




HEAT EXCHANGER (H.E.) REQUIREMENTS

REFER TO B3649K FOR HEAT EXCHANGER DATA.

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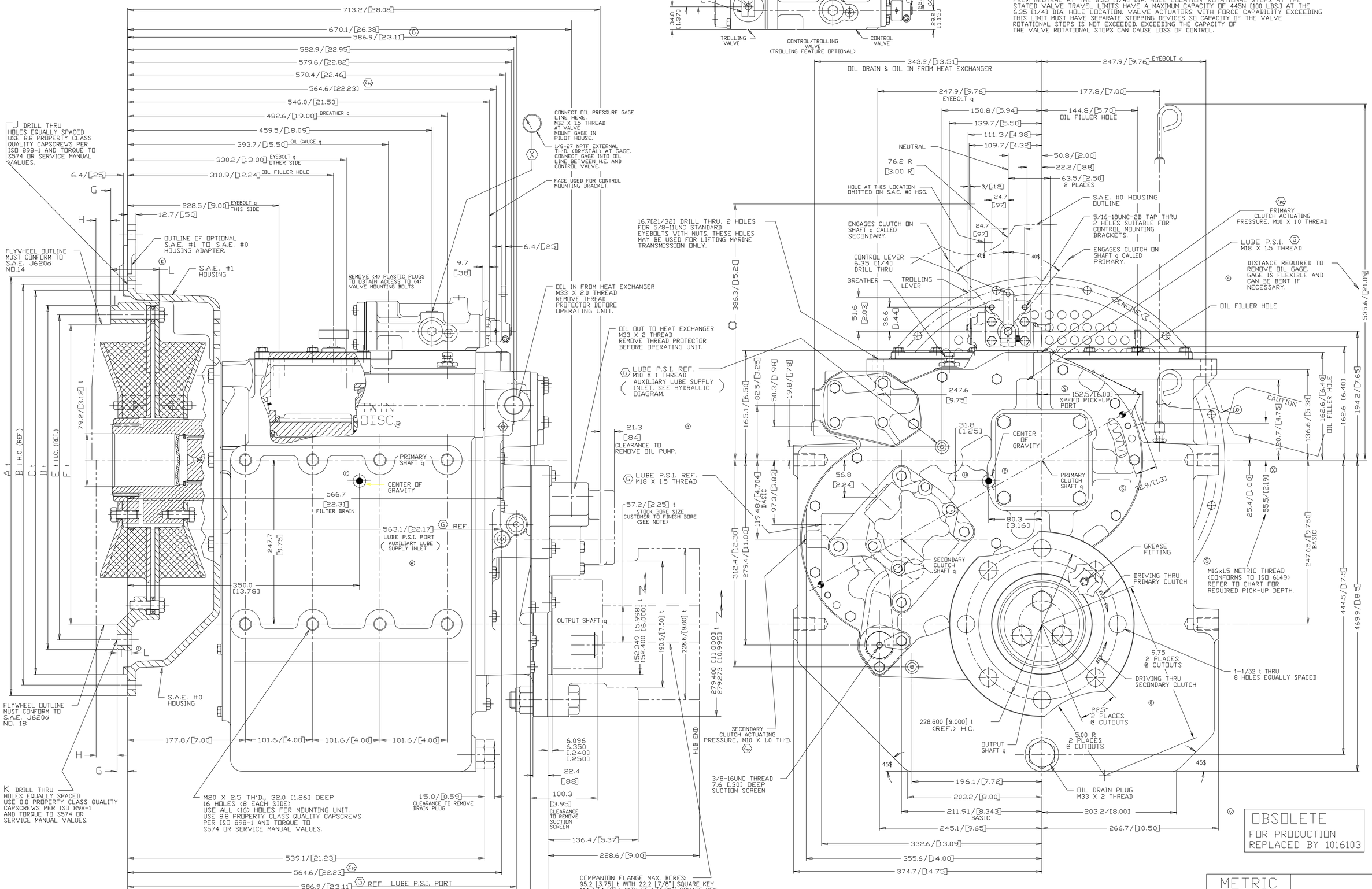
CONTROL VALVE:

444-133N [10-30 LBS.] AT THE 56.0 [2.20]R LOCATION OF THE 6.35 [1/4] DIA. HOLE IS REQUIRED TO OVERCOME DETENT EFFORT. THE DETENT FEATURE IS PROVIDED IN THE FULL PRIMARY CLUTCH, FULL SECONDARY CLUTCH AND NEUTRAL LEVER POSITIONS. (THE DETENT SPRING AND PIN MAY BE OMITTED WHEN REMOTE CONTROL SYSTEMS PROVIDE THE PRIMARY, NEUTRAL AND SECONDARY DETENTS THAT CORRESPOND EXACTLY WITH VALVE DETENT POSITIONS. FORCE AT THE LEVER HOLE TO OPERATE THE VALVE THEN REDUCES TO 13-31N [3-7 LBS.] THE REMOTE CONTROL VALVE ACTUATOR MUST PROVIDE ⌀35.8 [1.41] LINEAR TRAVEL FROM NEUTRAL AT THE 6.35 [1/4] DIA. HOLE LOCATION. ROTATIONAL STOPS AT THE STATED VALVE TRAVEL LIMITS HAVE A MAXIMUM CAPACITY OF 445N [100 LBS.] AT THE 6.35 [1/4] DIA. HOLE LOCATION. VALVE ACTUATORS WITH FORCE CAPABILITY EXCEEDING THIS LIMIT MUST HAVE SEPARATE STOPPING DEVICES SO CAPACITY OF THE VALVE ROTATIONAL STOPS IS NOT EXCEEDED. EXCEEDING THE CAPACITY OF THE VALVE ROTATIONAL STOPS CAN CAUSE LOSS OF CONTROL.


713.2/[28.08]
670.1/[26.38] G
586.9/[23.11]
582.9/[22.95]
579.6/[22.82]
570.4/[22.46] Z-FV
564.6/[22.23]
546.0/[21.50]
482.6/[19.00] BREATHER q
459.5/[18.09]
393.7/[15.50] OIL GAUGE q
330.2/[13.00] EYEBOLT q OTHER SIDE
310.9/[12.24] OIL FILLER HOLE
228.5/[9.00] EYEBOLT q THIS SIDE
J DRILL THRU HOLES EQUALLY SPACED USE 8.8 PROPERTY CLASS QUALITY CAPSCREWS PER ISO 898-1 AND TORQUE TO S574 OR SERVICE MANUAL VALUES.
6.4/[25]
12.7/[50]
FLYWHEEL OUTLINE MUST CONFORM TO S.A.E. J620d NO.14
OUTLINE OF OPTIONAL S.A.E. #1 TO S.A.E. #0 HOUSING ADAPTER.
S.A.E. #1 HOUSING
REMOVE (4) PLASTIC PLUGS TO OBTAIN ACCESS TO (4) VALVE MOUNTING BOLTS.
9.7 [.38]
CONNECT OIL PRESSURE GAGE LINE HERE. M12 X 1.5 THREAD AT VALVE MOUNT GAGE IN PILOT HOUSE.
1/8-27 NPTF EXTERNAL TH'D. (DRYSEAL) AT GAGE. CONNECT GAGE INTO OIL LINE BETWEEN H.E. AND CONTROL VALVE.
FACE USED FOR CONTROL MOUNTING BRACKET.
OIL IN FROM HEAT EXCHANGER M33 X 2.0 THREAD REMOVE THREAD PROTECTOR BEFORE OPERATING UNIT.
OIL OUT TO HEAT EXCHANGER M33 X 2 THREAD REMOVE THREAD PROTECTOR BEFORE OPERATING UNIT.
G LUBE P.S.I. REF. M10 X 1 THREAD AUXILIARY LUBE SUPPLY INLET. SEE HYDRAULIC DIAGRAM.
21.3 [.84] CLEARANCE TO REMOVE OIL PUMP.
G LUBE P.S.I. REF. M18 X 1.5 THREAD
57.2/[2.25] t STOCK BORE SIZE CUSTOMER TO FINISH BORE (SEE NOTE)
TWIN DISC
PRIMARY SHAFT q
CENTER OF GRAVITY
566.7 [22.31] FILTER DRAIN
563.1/[22.17] G REF. LUBE P.S.I. PORT AUXILIARY LUBE SUPPLY INLET
247.7 [9.75]
350.0 [13.78]
OUTPUT SHAFT q
152.349 [5.998] t
152.400 [6.000] t
190.5/[7.50] t
228.6/[9.00] t
279.400 [11.000] t
279.273 [10.995] t
HUB END
6.096
6.350 [.240] [.250]
22.4 [.88]
100.3 [3.95] CLEARANCE TO REMOVE SUCTION SCREEN
15.0/[0.59] CLEARANCE TO REMOVE DRAIN PLUG
136.4/[5.37]
228.6/[9.00]
539.1/[21.23]
564.6/[22.23] Z-SV
586.9/[23.11] G REF. LUBE P.S.I. PORT
608.3/[23.95]
634.3/[24.97]
M20 X 2.5 TH'D., 32.0 [1.26] DEEP 16 HOLES (8 EACH SIDE) USE ALL (16) HOLES FOR MOUNTING UNIT. USE 8.8 PROPERTY CLASS QUALITY CAPSCREWS PER ISO 898-1 AND TORQUE TO S574 OR SERVICE MANUAL VALUES.
K DRILL THRU HOLES EQUALLY SPACED USE 8.8 PROPERTY CLASS QUALITY CAPSCREWS PER ISO 898-1 AND TORQUE TO S574 OR SERVICE MANUAL VALUES.
FLYWHEEL OUTLINE MUST CONFORM TO S.A.E. J620d NO. 18
S.A.E. #0 HOUSING
177.8/[7.00]
101.6/[4.00]
101.6/[4.00]
101.6/[4.00]
A t
B t H.C. (REF.)
C t
D t
E t H.C. (REF.)
F t
79.2/[3.12] t
343.2/[13.51] OIL DRAIN & OIL IN FROM HEAT EXCHANGER
247.9/[9.76] EYEBOLT q
247.9/[9.76] EYEBOLT q
177.8/[7.00]
150.8/[5.94]
144.8/[5.70] OIL FILLER HOLE
139.7/[5.50]
111.3/[4.38]
109.7/[4.32]
NEUTRAL
76.2 R [3.00 R]
50.8/[2.00]
22.2/[.88]
63.5/[2.50] 2 PLACES
3/[.12]
HOLE AT THIS LOCATION OMITTED ON S.A.E. #0 HSG.
24.7 [.97]
S.A.E. #0 HOUSING OUTLINE
16.7[21/32] DRILL THRU, 2 HOLES FOR 5/8-11UNC STANDARD EYEBOLTS WITH NUTS. THESE HOLES MAY BE USED FOR LIFTING MARINE TRANSMISSION ONLY.
ENGAGES CLUTCH ON SHAFT q CALLED SECONDARY.
5/16-18UNC-2B TAP THRU 2 HOLES SUITABLE FOR CONTROL MOUNTING BRACKETS.
Z-FV PRIMARY CLUTCH ACTUATING PRESSURE, M10 X 1.0 THREAD
G LUBE P.S.I. M18 X 1.5 THREAD
CONTROL LEVER 6.35 [1/4] DRILL THRU
ENGAGES CLUTCH ON SHAFT q CALLED PRIMARY.
DISTANCE REQUIRED TO REMOVE OIL GAGE. GAGE IS FLEXIBLE AND CAN BE BENT IF NECESSARY.
BREATHER
TROLLING LEVER
ENGINE C
OIL FILLER HOLE
386.3/[15.21]
51.6 [2.03]
36.6 [1.44]
535.6/[21.09]
165.1/[6.50]
82.5/[3.25]
50.3/[1.98]
19.8/[.78]
247.6 [9.75]
152.5/[6.00] S SPEED PICK-UP PORT
CAUTION
162.6 [6.40] OIL FILLER HOLE
168.6 [6.40]
194.2/[7.65]
120.7/[4.75]
136.6/[5.38]
31.8 [1.25]
CENTER OF GRAVITY
119.48/[4.704] BASIC
97.3/[3.83]
56.8 [2.24]
PRIMARY CLUTCH SHAFT q
32.9/[1.3]
80.3 [3.16]
25.4/[1.00]
55.5/[219] S
312.4/[12.30]
279.4/[11.00]
247.65/[9.750] BASIC
444.5/[17.5]
469.9/[18.5]
GREASE FITTING
SECONDARY CLUTCH SHAFT q
DRIVING THRU PRIMARY CLUTCH
S M16x1.5 METRIC THREAD (CONFORMS TO ISO 6149) REFER TO CHART FOR REQUIRED PICK-UP DEPTH.
9.75 2 PLACES @ CUTOUTS
1-1/32 t THRU 8 HOLES EQUALLY SPACED
DRIVING THRU SECONDARY CLUTCH
22.5- 2 PLACES @ CUTOUTS
228.600 [9.000] t (REF.) H.C.
5.00 R 2 PLACES @ CUTOUTS
OUTPUT SHAFT q
SECONDARY CLUTCH ACTUATING PRESSURE, M10 X 1.0 TH'D. Z-SV
3/8-16UNC THREAD 7.6 [.30] DEEP SUCTION SCREEN
45$
OIL DRAIN PLUG M33 X 2 THREAD
196.1/[7.72]
203.2/[8.00]
211.91/[8.343] BASIC
203.2/[8.00]
245.1/[9.65]
266.7/[10.50]
332.6/[13.09]
355.6/[14.00]
374.7/[14.75]

OBSOLETE
FOR PRODUCTION
REPLACED BY 1016103

| SAE NO | S.A.E. J620d MARINE TRANSMISSION FLYWHEEL NO. | A | B | C +0.000 -0.127 (+.000-.005) | D +0.000 -0.102 (+.000-.004) | E | F | G | H | J Ⓐ | K Ⓐ | L Ⓐ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 18 | 711.2 (28.00) | 679.45 (26.750) | 647.70 (25.500) | 571.50 (22.500) | 542.92 (21.375) | 495.3 (19.50) | 15.7 (.62) | 31.8 (1.25) | 15.88 (.62) 12.7 (1/2) | 6.05 (.24) 4.6 (.18) | 73.15 (2.88) |
| 1 | 14 | 552.4 (21.75) | 530.20 (20.875) | 511.17 (20.125) | 466.725 (18.375) | 438.15 (17.250) | 409.4 (16.12) | 25.4 (1.00) | 22.4 (.88) | 11.9 (15/32) | 9.65 (.38) 7.5 (.53) | 22.4 (.88) |

Ⓞ OPTIONAL TEMPERATURE INDICATING SWITCH: CUSTOMER TO INSTALL IN A [3/4 X 3/4 X 3/4] PIPE TEE IN THE HYDRAULIC LINE LEADING FROM THE MARINE TRANSMISSION PUMP TO THE HEAT EXCHANGER INLET. REFER TO HYDRAULIC DIAGRAM.

NOTE: ALL POINTS AVAILABLE FOR TESTING ARE CODED ⬡.

COMPANION FLANGE MAX. BORES:
95.2 [3.75] t WITH 22.2 [7/8"] SQUARE KEY
114.3 [4.50] t WITH 25.4 [1.00"] SQUARE KEY
120.6 [4.75] t WITH 31.8 [1-1/4"] SQUARE KEY
139.7 [5.50] t WITH 31.8 [1-1/4"] X 22.2 [7/8"] RECT. KEY & .125:1 (1.50IN./FT.) TAPER

INCH DIMENSIONS AND POUNDS SHOWN IN BRACKETS

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

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MATERIAL | HEAT TREAT | SURFACE TREATMENT | WEIGHT kg | We N m² | FIRST USE | ASSY. | MODEL | NAME Ⓑ MG5202(SC) MARINE TRANSMISSION

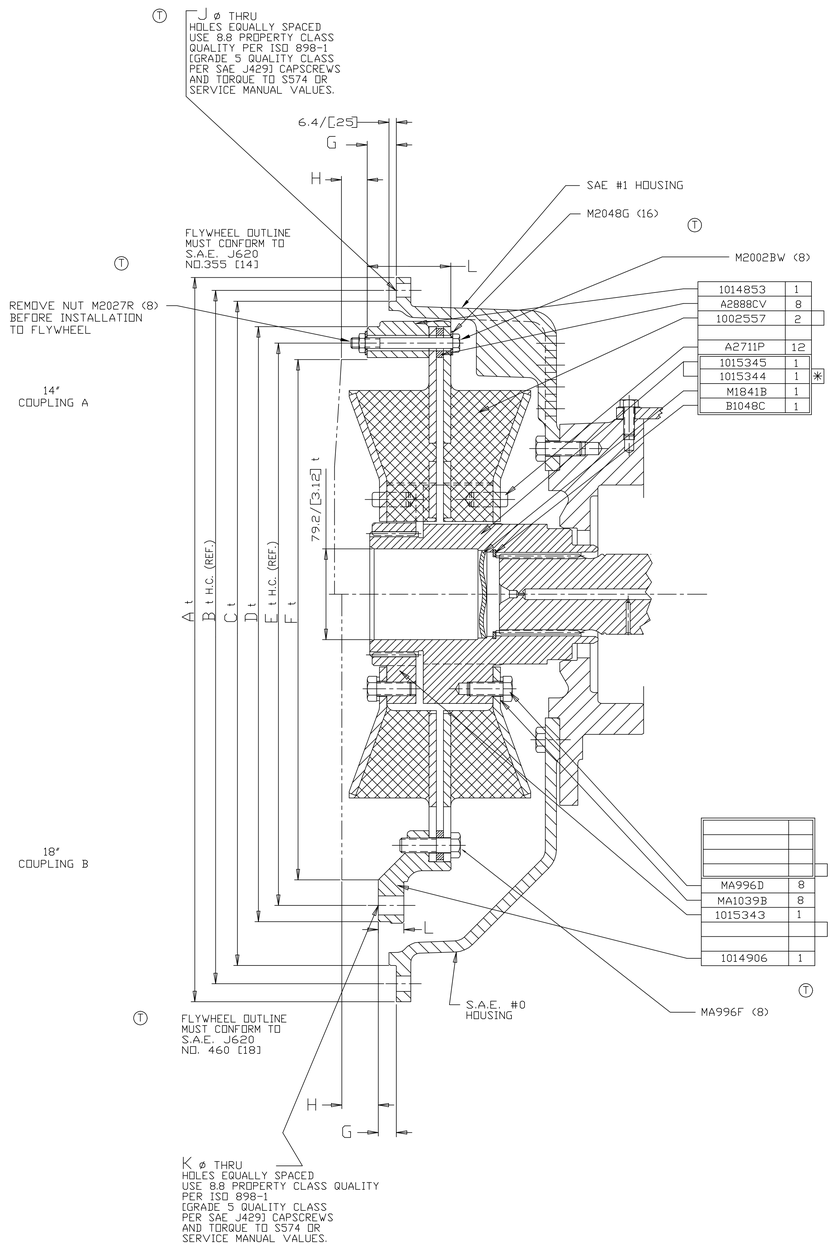
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES AND GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 3-25-93 | SCALE .50 #1" | DRN. KS | CHK. JS | APPD. TBC

TWIN DISC INCORPORATED RACINE, WI 53403 - USA

1014841

SHEET 2 OF 4Ⓥ REV X_




COUPLING "A"
FLEXIBLE COUPLING
LS14E-4400
14"

COUPLING "B"
FLEXIBLE COUPLING
LS14E-4400
18"

| COUPLING | COUPLING SIZE NO. | MAX. COUPLING R.P.M. (REF.) ✱ | NOMINAL TORQUE | DYNAMIC TORSIONAL STIFFNESS | WR² WITHOUT TORSIONAL STOP | | WR² WITH TORSIONAL STOP | |
|---|---|---|---|---|---|---|---|---|
| | | | | | OUTER PARTS | INNER PARTS | OUTER PARTS | INNER PARTS |
| A | LS14E-4400 | 2500 | 6.24 kN·m [55.2 x $10^3$ lbf·in] | 38.6 kN·m/rad [.342 x $10^6$ lbf·in/rad] | ——— | ——— | 0.76 kg·m² [2589 lb·in²] | 0.30 kg·m² [1011 lb·in²] |
| B | LS14E-4400 | 2500 | 6.24 kN·m [55.2 x $10^3$ lbf·in] | 38.6 kN·m/rad [.342 x $10^6$ lbf·in/rad] | ——— | ——— | 0.93 kg·m² [3169 lb·in²] | 0.30 kg·m² [1011 lb·in²] |

SEE SHEET 1 FOR MAXIMUM TRANSMISSION R.P.M.

THE $WR^2$ OF THE INNER PARTS INCLUDES HUB AND 1/4 SHAFT $C_2$ .

FOR OTHER TRANSMISSION MASS ELASTIC DATA, REFER TO B3504AE.

FOR OTHER TRANSMISSION INSTALLATION DIMENSIONS, REFER TO 1014841, SHEET 2.

| SAE NO | S.A.E. J620 MARINE TRANSMISSION FLYWHEEL NO. | A | B | C +0.000 -0.127 [+.000-.005] | D +0.000 -0.102 [+.000-.004] | E | F | G | H | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 460 [18] | 711,2 [28.00] | 679,45 [26.750] | 647,70 [25.500] | 571,50 [22.500] | 542,92 [21.375] | 495,3 [19.50] | 15,7 [.62] | 31,8 [1.25] | 15 OF 13,5 [17/32] | 6 OF 16,7 [.66] | 22.4 [.88] |
| 1 | 355 [14] | 552,4 [21.75] | 530,20 [20.875] | 511,17 [20.125] | 466,725 [18.375] | 438,15 [17.250] | 409,4 [16.12] | 25,4 [1.00] | 22,4 [.88] | 12 OF 11,9 [15/32] | 8 OF 13,5 [.53] | 73.15 [2.88] |

NOTE:
UNITS WITH THIS FLEXIBLE COUPLING ARE APPROVED FOR RIGHT-HAND ENGINE ROTATION ONLY, DUE TO COUPLING RESTRICTION.

ADVANCE MARINE TRANSMISSION INTO POSITION WITH ENGINE FLYWHEEL HOUSING MOUNTING FLANGE. LINE UP INPUT SHAFT EXTERNAL SPLINE WITH INTERNAL SPLINE IN COUPLING HUB AND MOVE ENGINE AND MARINE TRANSMISSION TOGETHER MAINTAINING ENGINE FLYWHEEL HOUSING AND MARINE TRANSMISSION FLYWHEEL HOUSING MOUNTING FACES IN PARALLEL RELATIONSHIP. ENGAGE FLYWHEEL HOUSING PILOTS AND INSTALL ALL MOUNTING CAPSCREWS USING 8.8 PROPERTY CLASS QUALITY PER ISO 898-1 [GRADE 5 QUALITY CAPSCREWS PER S.A.E. J429] TORQUED TO S574 OR SERVICE MANUAL VALUES.

✱ NOT SERVICEABLE SEPARATELY.

Ⓣ SECURE FLEXIBLE COUPLING TO HOUSING S.A.E. FLANGE HOLES, USING STANDARD METHOD, BEFORE SHIPMENT OF UNIT.

Ⓥ OBSOLETE
FOR PRODUCTION
REPLACED BY 1016103

INCH DIMENSIONS AND POUNDS SHOWN IN BRACKETS [ ].

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

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MATERIAL
HEAT TREAT
SURFACE TREATMENT
WEIGHT kg
$WR^2$ N·m²
FIRST USE
ASSY.
MODEL
NAME MG5202(SC) MARINE TRANSMISSION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X. ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 6-3-94
SCALE .50 =1
DRN. DM
CHK DAS
APPD. DAS

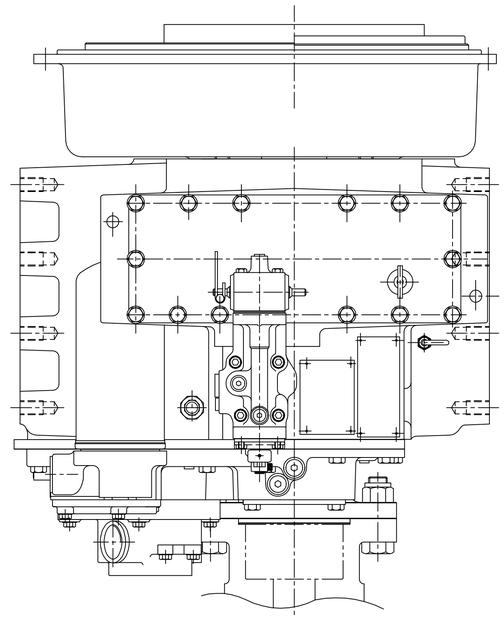
TWIN DISC INCORPORATED RACINE, WI 53403 - USA

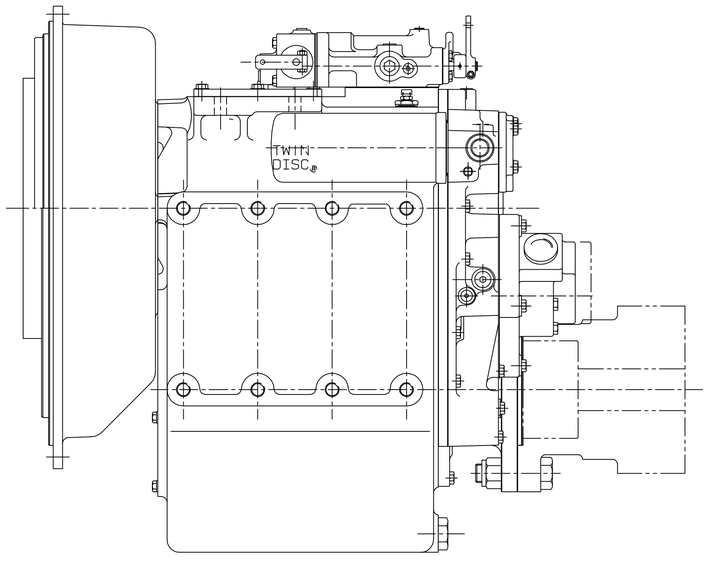
1014841

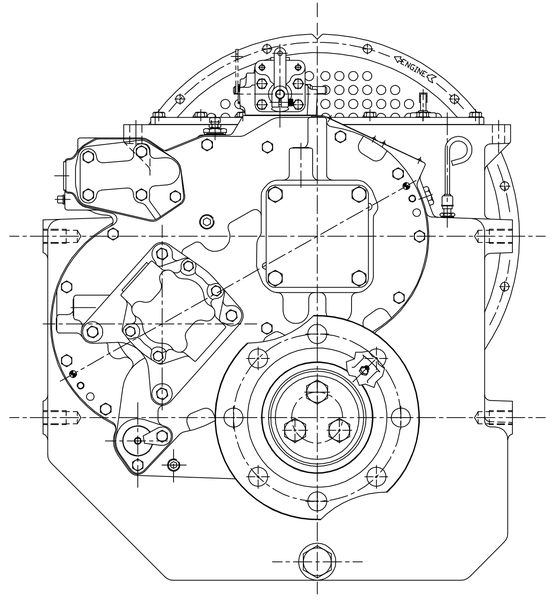
SHEET 3 OF 4 Ⓥ REV X

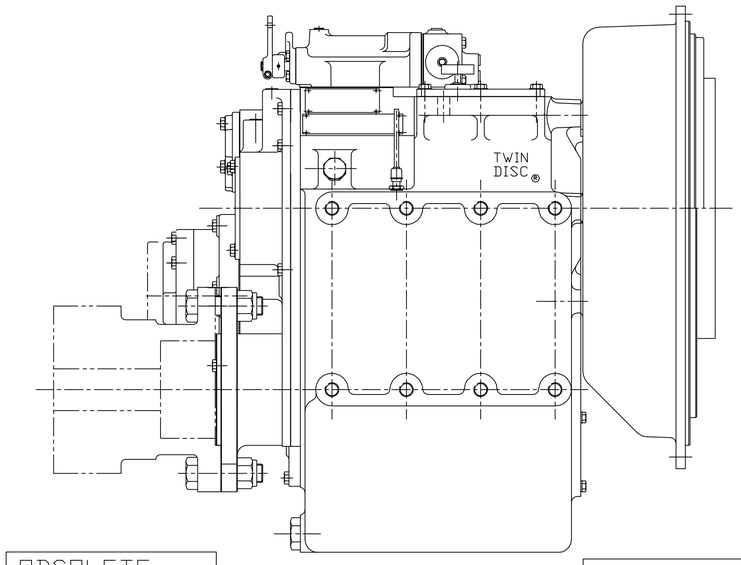
E D C B A

1 2 3 4 5 6






Ⓥ OBSOLETE
FOR PRODUCTION
REPLACED BY 1016103

Ⓐ WAS EX8487-26

METRIC

THIRD ANGLE PROJECTION

SIMILAR TO

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| | | | |
|---|---|---|---|
| MATERIAL | WEIGHT LBS. / VR² LBS. IN² | UNLESS OTHERWISE SPECIFIED: MACHINED DIMENSIONS X.X ±0.030, X.XX ±0.010, X.XXX ±0.005; ALL ANGULAR TOLERANCES ±1°; GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982 | DATE 4-12-94 |
| HEAT TREAT | FIRST USE ASSY. MODEL | | SCALE .25=1.00 |
| SURFACE TREATMENT | NAME MG5202 (SC) MARINE TRANSMISSION | | DRN. TBM; CHK. KS; APPD. DAS |

TWIN DISC INCORPORATED
RACINE, WI 53403 - USA

1014841

SHEET 4 OF 4 Ⓓ REV X

## ASSEMBLY INSTRUCTIONS:

### THESE STANDARDS APPLY:

S574 FASTENER TORQUE REQUIREMENTS
S692 BEARING SHIMMING
S765 TAPERED JOINT ASSEMBLY
S774 ANAEROBIC SEALANT APPLICATION

### XA7371S CONTROL VALVE ASSEMBLY

| | |
|---|---|
| B1703D PRESSURE GAUGE | 1 |
| M2051CD PIPE PLUG | 1 |
| A7361B | 1 |
| M2089F | 2 |
| M2089F | 2 |
| M2067X PLASTIC CLOSURE | 4 |
| B1397D | 1 |
| B1399C | 1 |
| B2334 | AS REQ'D |
| B1333D | 1 |
| M2001P | 4 |

| | |
|---|---|
| M2782C | 2 |
| A2916DK | 2 |
| 204087 | 1 |
| A2702BP | 1 |
| 2039 | 1 |
| B1334A | 1 |
| M1990E | 1 |
| M2001M | 4 |
| M1731AF | 1 |
| B1867 | 1 |
| M1927B | 1 |
| B3574A | 1 |
| M2042AT | 2 |
| 1014883 | AS REQ'D. |
| 1014884 | |
| 1014885 | |

SEE NOTE #6

| | | |

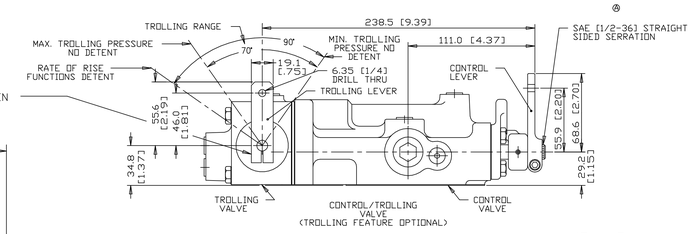
(OPTIONAL) TROLLING VALVE INSTALLATION AND OPERATING NOTES:

1) REFER TO VALVE ASSEMBLY DRAWING FOR ADDITIONAL INSTALLATION NOTES. CONTROL HEAD FOR TROLLING VALVE MUST INCLUDE A DEVICE TO LOCK TROLLING VALVE CONTROL LEVER IN THE DETENTED NO-TROLL POSITION DURING MANEUVERING, DOCKING AND OTHER OPERATING CONDITIONS THAT REQUIRE FULL POWER TO THE PROPELLER.

2) MAXIMUM ENGINE SPEED WHILE TROLLING 1100 RPM OR 60% OF FULL-LOAD ENGINE SPEED, WHICHEVER IS SMALLER.

3) WITH CONTROL VALVE LEVER IN NEUTRAL, SELECT TROLLING FUUCTION BY MOVING TROLLING CONTROL LEVER OUT OF LOCKED DETENTED POSITION TO MAXIMUM TROLLING POSITION. SELECT TROLLING DIRECTION OF TRAVEL BY MOVING CONTROL VALVE LEVER TO THE PRIMARY CLUTCH OR SECONDARY CLUTCH POSITION. MOVE TROLLING CONTROL LEVER FROM MINIMUM TROLLING POSITION TO SELECT DESIRED TROLLING SPEED. WHEN TROLLING LEVER IS ADVANCED CLOSE TO DETENTED NO-TROLL POSITION, THE TROLLING CLUTCH MAY ENGAGE FULLY.

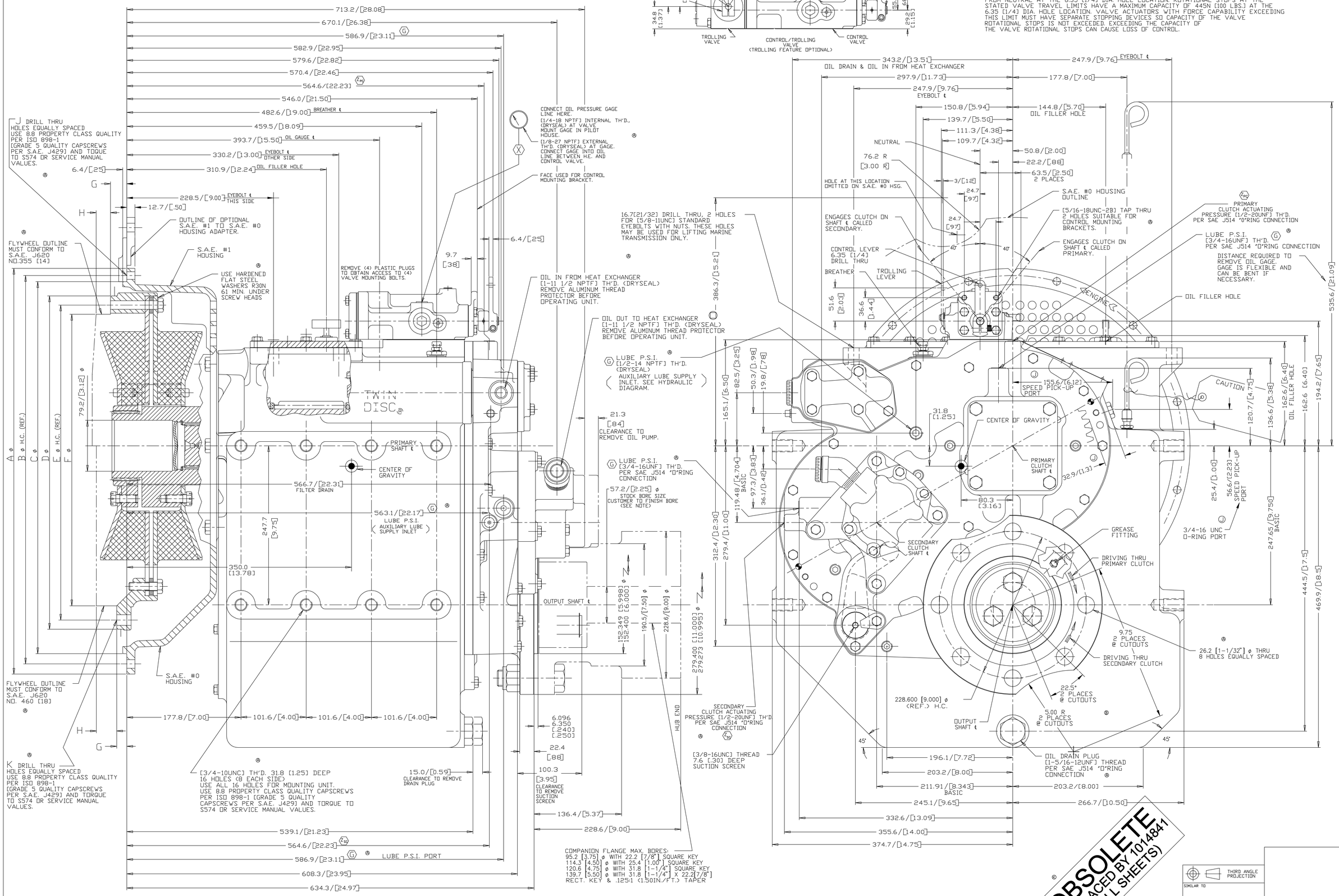
THE TROLLING LEVER ANGULAR LOCATION MAY BE ADJUSTED SO THAT THE 90° LEVER ROTATION REQUIRED FOR CONTROL FALLS ANYWHERE WITHIN THE 360° RANGE IN WHICH THE LEVER MAY BE LOCATED.




CONTROL VALVE:

444-133N [10-30 LBS.] AT THE 56.0 [2.20]R LOCATION OF THE 6.35 [1/4] DIA. HOLE IS REQUIRED TO OVERCOME DETENT EFFORT. THE DETENT FEATURE IS PROVIDED IN THE FULL PRIMARY CLUTCH, FULL SECONDARY CLUTCH AND NEUTRAL LEVER POSITIONS. (THE DETENT SPRING AND PIN MAY BE OMITTED WHEN REMOTE CONTROL SYSTEMS PROVIDE THE PRIMARY, NEUTRAL AND SECONDARY DETENTS THAT CORRESPOND EXACTLY WITH VALVE DETENT POSITIONS. FORCE AT THE LEVER HOLE TO OPERATE THE VALVE THEN REDUCES TO 13-31N [3-7 LBS.) THE REMOTE CONTROL VALVE ACTUATOR MUST PROVIDE ±35.8 [1.41] LINEAR TRAVEL FROM NEUTRAL AT THE 6.35 [1/4] DIA. HOLE LOCATION. ROTATIONAL STOPS AT THE STATED VALVE TRAVEL LIMITS HAVE A MAXIMUM CAPACITY OF 445N [100 LBS.] AT THE 6.35 [1/4] DIA. HOLE LOCATION. VALVE ACTUATORS WITH FORCE CAPABILITY EXCEEDING THIS LIMIT MUST HAVE SEPARATE STOPPING DEVICES SO CAPACITY OF THE VALVE ROTATIONAL STOPS IS NOT EXCEEDED. EXCEEDING THE CAPACITY OF THE VALVE ROTATIONAL STOPS CAN CAUSE LOSS OF CONTROL.

HEAT EXCHANGER (H.E.) REQUIREMENTS
REFER TO B3649K FOR HEAT EXCHANGER DATA.


713.2/[28.08]
670.1/[26.38]
586.9/[23.11]
582.9/[22.95]
579.6/[22.82]
570.4/[22.46]
564.6/[22.23]
546.0/[21.50]
482.6/[19.00] BREATHER ℄
459.5/[18.09]
393.7/[15.50] OIL GAUGE ℄
330.2/[13.00] EYEBOLT ℄ OTHER SIDE
310.9/[12.24] OIL FILLER HOLE
J DRILL THRU HOLES EQUALLY SPACED USE 8.8 PROPERTY CLASS QUALITY PER ISO 898-1 (GRADE 5 QUALITY CAPSCREWS PER S.A.E. J429) AND TOQUE TO S574 OR SERVICE MANUAL VALUES.
6.4/[.25]
G
228.5/[9.00] EYEBOLT ℄ THIS SIDE
12.7/[.50]
H
OUTLINE OF OPTIONAL S.A.E. #1 TO S.A.E. #0 HOUSING ADAPTER.
FLYWHEEL OUTLINE MUST CONFORM TO S.A.E. J620 NO.355 [14]
S.A.E. #1 HOUSING
USE HARDENED FLAT STEEL WASHERS R30N 61 MIN. UNDER SCREW HEADS
REMOVE (4) PLASTIC PLUGS TO OBTAIN ACCESS TO (4) VALVE MOUNTING BOLTS.
9.7 [.38]
6.4/[.25]
CONNECT OIL PRESSURE GAGE LINE HERE. (1/4-18 NPTF) INTERNAL TH'D., (DRYSEAL) AT VALVE MOUNT GAGE IN PILOT HOUSE.
(1/8-27 NPTF) EXTERNAL TH'D. (DRYSEAL) AT GAGE. CONNECT GAGE INTO OIL LINE BETWEEN H.E. AND CONTROL VALVE.
FACE USED FOR CONTROL MOUNTING BRACKET.
OIL IN FROM HEAT EXCHANGER (1-11 1/2 NPTF) TH'D. (DRYSEAL) REMOVE ALUMINUM THREAD PROTECTOR BEFORE OPERATING UNIT.
OIL OUT TO HEAT EXCHANGER (1-11 1/2 NPTF) TH'D. (DRYSEAL) REMOVE ALUMINUM THREAD PROTECTOR BEFORE OPERATING UNIT.
LUBE P.S.I. (1/2-14 NPTF) TH'D. (DRYSEAL)
AUXILIARY LUBE SUPPLY INLET. SEE HYDRAULIC DIAGRAM.
21.3 [.84] CLEARANCE TO REMOVE OIL PUMP.
LUBE P.S.I. (3/4-16UNF) TH'D. PER SAE J514 "O"RING CONNECTION
57.2/[2.25] ϕ STOCK BORE SIZE CUSTOMER TO FINISH BORE (SEE NOTE)
LUBE P.S.I. AUXILIARY LUBE SUPPLY INLET
563.1/[22.17]
247.7 [9.75]
350.0 [13.78]
566.7/[22.31] FILTER DRAIN
CENTER OF GRAVITY
PRIMARY SHAFT ℄
A ϕ
B ϕ H.C. (REF.)
C ϕ
D ϕ
E ϕ H.C. (REF.)
F ϕ
79.2/[3.12] ϕ
TWIN DISC
OUTPUT SHAFT ℄
152.349 [5.998] ϕ
152.400 [6.000] ϕ
190.5/[7.50] ϕ
228.6/[9.00] ϕ
279.400 [11.000] ϕ
279.273 [10.995] ϕ
HUB END
S.A.E. #0 HOUSING
FLYWHEEL OUTLINE MUST CONFORM TO S.A.E. J620 NO. 460 [18]
177.8/[7.00]
101.6/[4.00]
101.6/[4.00]
101.6/[4.00]
H
G
K DRILL THRU HOLES EQUALLY SPACED USE 8.8 PROPERTY CLASS QUALITY PER ISO 898-1 (GRADE 5 QUALITY CAPSCREWS PER S.A.E. J429) AND TORQUE TO S574 OR SERVICE MANUAL VALUES.
(3/4-10UNC) TH'D. 31.8 [1.25] DEEP 16 HOLES (8 EACH SIDE) USE ALL 16 HOLES FOR MOUNTING UNIT. USE 8.8 PROPERTY CLASS QUALITY CAPSCREWS PER ISO 898-1 (GRADE 5 QUALITY CAPSCREWS PER S.A.E. J429) AND TORQUE TO S574 OR SERVICE MANUAL VALUES.
15.0/[0.59] CLEARANCE TO REMOVE DRAIN PLUG
6.096 6.350 [.240] [.250]
22.4 [.88]
100.3 [3.95] CLEARANCE TO REMOVE SUCTION SCREEN
136.4/[5.37]
228.6/[9.00]
539.1/[21.23]
564.6/[22.23]
586.9/[23.11]
608.3/[23.95]
634.3/[24.97]
LUBE P.S.I. PORT
COMPANION FLANGE MAX. BORES:
95.2 [3.75] ϕ WITH 22.2 [7/8"] SQUARE KEY
114.3 [4.50] ϕ WITH 25.4 [1.00"] SQUARE KEY
120.6 [4.75] ϕ WITH 31.8 [1-1/4"] SQUARE KEY
139.7 [5.50] ϕ WITH 31.8 [1-1/4"] X 22.2[7/8"] RECT. KEY & .125:1 (1.50IN./FT.) TAPER
343.2/[13.51]
OIL DRAIN & OIL IN FROM HEAT EXCHANGER
247.9/[9.76] EYEBOLT ℄
297.9/[11.73]
177.8/[7.00]
247.9/[9.76] EYEBOLT ℄
150.8/[5.94]
144.8/[5.70] OIL FILLER HOLE
139.7/[5.50]
111.3/[4.38]
109.7/[4.32]
NEUTRAL
76.2 R [3.00 R]
50.8/[2.00]
22.2/[.88]
63.5/[2.50] 2 PLACES
3/[.12]
24.7 [.97]
HOLE AT THIS LOCATION OMITTED ON S.A.E. #0 HSG.
S.A.E. #0 HOUSING OUTLINE
16.7[21/32] DRILL THRU, 2 HOLES FOR (5/8-11UNC) STANDARD EYEBOLTS WITH NUTS. THESE HOLES MAY BE USED FOR LIFTING MARINE TRANSMISSION ONLY.
(5/16-18UNC-2B) TAP THRU 2 HOLES SUITABLE FOR CONTROL MOUNTING BRACKETS.
ENGAGES CLUTCH ON SHAFT ℄ CALLED SECONDARY.
24.7 [.97]
40°
40°
ENGAGES CLUTCH ON SHAFT ℄ CALLED PRIMARY.
PRIMARY CLUTCH ACTUATING PRESSURE (1/2-20UNF) TH'D. PER SAE J514 "O"RING CONNECTION
LUBE P.S.I. (3/4-16UNF) TH'D. PER SAE J514 "O"RING CONNECTION
DISTANCE REQUIRED TO REMOVE OIL GAGE. GAGE IS FLEXIBLE AND CAN BE BENT IF NECESSARY.
535.6/[21.09]
CONTROL LEVER 6.35 [1/4] DRILL THRU
BREATHER
TROLLING LEVER
51.6 [2.03]
36.6 [1.44]
386.3/[15.21]
OIL FILLER HOLE
ENGINE
155.6/[6.12] SPEED PICK-UP PORT
CAUTION
165.1/[6.50]
82.5/[3.25]
50.3/[1.98]
19.8/[.78]
31.8 [1.25]
CENTER OF GRAVITY
120.7/[4.75]
136.6/[5.38]
162.6/[6.40] OIL FILLER HOLE
162.6 [6.40]
194.2/[7.65]
119.48/[4.704] BASIC
97.3/[3.83]
36.1/[1.42]
PRIMARY CLUTCH SHAFT ℄
32.9/[1.3]
25.4/[1.00]
56.6/[2.23] SPEED PICK-UP PORT
3/4-16 UNC ϕ-RING PORT
247.65/[9.750] BASIC
312.4/[12.30]
279.4/[11.00]
SECONDARY CLUTCH SHAFT ℄
80.3 [3.16]
GREASE FITTING
DRIVING THRU PRIMARY CLUTCH
9.75 2 PLACES @ CUTOUTS
DRIVING THRU SECONDARY CLUTCH
26.2 [1-1/32"] ϕ THRU 8 HOLES EQUALLY SPACED
444.5/[17.5]
469.9/[18.5]
SECONDARY CLUTCH ACTUATING PRESSURE (1/2-20UNF) TH'D PER SAE J514 "O"RING CONNECTION
[3/8-16UNC] THREAD 7.6 [.30] DEEP SUCTION SCREEN
228.600 [9.000] ϕ (REF.) H.C.
22.5° 2 PLACES @ CUTOUTS
5.00 R 2 PLACES @ CUTOUTS
OUTPUT SHAFT ℄
OIL DRAIN PLUG (1-5/16-12UNF) THREAD PER SAE J514 "O"RING CONNECTION
45°
45°
196.1/[7.72]
203.2/[8.00]
211.91/[8.343] BASIC
203.2/[8.00]
245.1/[9.65]
266.7/[10.50]
332.6/[13.09]
355.6/[14.00]
374.7/[14.75]

| SAE NO | S.A.E. J620 MARINE TRANSMISSION FLYWHEEL NO. | A | B | C +.000 -.010 (+.000-.005) | D +.000 -.010 (+.000-.004) | E | F | G | H | J | K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 460 [18] | 711.2 (28.00) | 679.45 (26.750) | 647.70 (25.500) | 571.50 (22.500) | 542.92 (21.375) | 495.3 (19.50) | 15.7 (.62) | 31.8 (1.25) | 16.0R 13.5 (17/32) | 6.0R 16.7 (.66) |
| 1 | 355 [14] | 558.4 (21.75) | 530.60 (20.875) | 511.17 (20.125) | 466.725 (18.375) | 438.15 (17.250) | 409.4 (16.12) | 25.4 (1.00) | 22.4 (.88) | 9.5R 11.9 (15/32) | 8.0R 13.5 (.53) |

OPTIONAL TEMPERATURE INDICATING SWITCH:
CUSTOMER TO INSTALL IN A (3/4" X 3/4" X 3/4") PIPE TEE IN THE HYDRAULIC LINE LEADING FROM THE MARINE TRANSMISSION PUMP TO THE HEAT EXCHANGER INLET. REFER TO HYDRAULIC DIAGRAM.

NOTE:
ALL POINTS AVAILABLE FOR TESTING ARE CODED ⬡

METRIC
EXCEPT FOR INCH DIMENSIONS AND POUNDS SHOWN IN BRACKETS [ ]

OBSOLETE
REPLACED BY 1014841
(ALL SHEETS)

THIRD ANGLE PROJECTION
SIMILAR TO

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| | | | |
|---|---|---|---|
| MATERIAL | WEIGHT LBS. | V6* LBS. IN* | UNLESS OTHERWISE SPECIFIED: MACHINED DIMENSIONS XX ±0.030, XXX ±0.010, XXXX ±0.005; ALL ANGULAR TOLERANCES ±1°; GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982 |
| HEAT TREAT | FIRST USE | | |
| SURFACE TREATMENT | ASSY. | | |
| | MODEL | | |
| | NAME | MG5202(SC) MARINE TRANSMISSION | |

| | |
|---|---|
| DATE | 1-17-94 |
| SCALE | .50=1.00 |
| DRN. | KS |
| CHK. | JS |
| APP'D. | TBC |

TWIN DISC INCORPORATED
RACINE, WI 53403 - USA

1015389

SHEET 2 OF 2 REV JK

## ASSEMBLY INSTRUCTIONS:

(AC) ASSEMBLE AND TEST PER S570AE.
NOTES #1 THRU #7 ARE IN S570AE.

## THESE STANDARDS APPLY:

S574 FASTENER TORQUE REQUIREMENTS
S692 BEARING SHIMMING
S765 TAPERED JOINT ASSEMBLY

| | |
|---|---|
| MA217H | 2 |
| B1048BB | 2 |
| M2693P | 2 |
| 1015361 | 1 |
| * 1015360 | 1 |
| MA1034B STEEL BALL | 1 |
| M2943 THIS BEARING USED WITH 3.48:1 RATIO ONLY | 2 |
| M2795 | 2 |

| | |
|---|---|
| 1014857 | 2 |
| 1001380 | 1 |
| B6231 | 2 |
| A2669AU | 2 |
| 1001118 | 1 |

| | |
|---|---|
| 206107B | 20 |
| 206106P | 22 |
| B3616A | 2 |
| M2693E | 2 |

| | |
|---|---|
| XA2703BD | 32 |
| A2701BG | 1 |
| A2703BD | 1 |
| B6232 | 2 |

| | |
|---|---|
| 203190B | 2 |
| M1904DA | 2 |
| MA929 | 1 |
| A2706AC | 1 |
| M1990Q | 1 |
| MA960E | 2 |
| MA1039A | 2 |
| 1014856 | 2 |
| 1002091 | 1 |

| | |
|---|---|
| ASSEMBLE TAPERED EDGE SIDE AWAY FROM BEARING | |
| A2915CK | 2 |
| M1904AQ | 4 |

| | |
|---|---|
| 1016333 | 2 |
| 3.48:1 RATIO | 21 T |
| 1016330 | 2 |
| 2.92:1 RATIO | 24 T |
| 1016328 | 2 |
| 2.48:1 RATIO | 27 T |
| 1016324 | 2 |
| 2.03:1 RATIO | 31 T |
| 1016322 | 2 |
| 1.76:1 RATIO | 33 T |
| 1016320 | 2 |
| 1.53:1 RATIO | 36 T |
| 1018492 | 2 |
| 1.33:1 RATIO | 39 T |
| 1016318 | 2 |
| 1.17:1 RATIO | 42 T |

| | |
|---|---|
| 1001349 | 1 |
| 1001218 | 1 |
| 1015355 | 1 |

| | |
|---|---|
| 1018462 | 1 |
| 1015110 | 1 |

| | |
|---|---|
| 1001116 | 1 |
| 1015363 | 1 |

| | |
|---|---|
| A2703P | 1 |
| M1990H | 1 |
| B1398E | 2 |
| 1016114 | 1 |
| 1015109 | 1 |
| MA977 | 1 |
| (M) MA1038C | 1 |
| MA1039E | 16 |
| MA961A | 16 |

| | |
|---|---|
| 1015017 | 1 |

| | |
|---|---|
| MA996D | 12 |

| | |
|---|---|
| MA1038A | 2 |
| MA1038D | 2 |
| 202347 | 1 |
| A2916JZ | 1 |

| | |
|---|---|
| 1016112 | 1 |
| 1016111 | 1 * |
| MA1034B STEEL BALL | 1 |

| | |
|---|---|
| M1945BX | 1 |
| M2426 | 1 |

| | |
|---|---|
| 1014883 | AS REQ'D. |
| 1014884 | |
| 1014885 | |
| A2916FW | 1 |
| MA431 | 2 |
| 1016120 | 1 |
| 1016191 | 1 |

SEE NOTE #6

| | |
|---|---|
| M1945T | 1 |

SEE NOTE #4

| | |
|---|---|
| 1015018 | 1 |

| | |
|---|---|
| 1016107 | 1 |
| 1001421 | 1 |

ASSEMBLY 1016103
| | |
|---|---|
| 1016105 | 1 |

ASSEMBLY 1016103A
| | |
|---|---|
| 1016105A | 1 |

ASSEMBLY 1016103B
| | |
|---|---|
| 1016105C | 1 |

| | | |

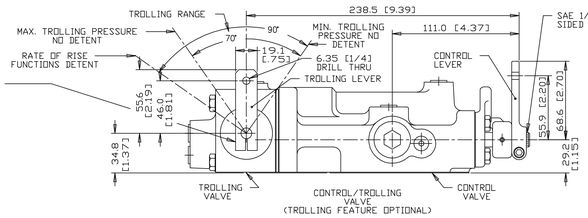
(OPTIONAL) TROLLING VALVE INSTALLATION AND OPERATING NOTES:

1) REFER TO VALVE ASSEMBLY DRAWING FOR ADDITIONAL INSTALLATION NOTES. CONTROL HEAD FOR TROLLING VALVE MUST INCLUDE A DEVICE TO LOCK TROLLING VALVE CONTROL LEVER IN THE DETENTED NO-TROLL POSITION DURING MANEUVERING, DOCKING AND OTHER OPERATING CONDITIONS THAT REQUIRE FULL POWER TO THE PROPELLER.

2) MAXIMUM ENGINE SPEED WHILE TROLLING 1100 RPM OR 60% OF FULL-LOAD ENGINE SPEED, WHICHEVER IS SMALLER.

3) WITH CONTROL VALVE LEVER IN NEUTRAL, SELECT TROLLING FUUCTION BY MOVING TROLLING CONTROL LEVER OUT OF LOCKED DETENTED POSITION TO MAXIMUM TROLLING POSITION. SELECT TROLLING DIRECTION OF TRAVEL BY MOVING CONTROL VALVE LEVER TO THE PRIMARY CLUTCH OR SECONDARY CLUTCH POSITION. MOVE TROLLING CONTROL LEVER FROM MINIMUM TROLLING POSITION TO SELECT DESIRED TROLLING SPEED. WHEN TROLLING LEVER IS ADVANCED CLOSE TO DETENTED NO-TROLL POSITION, THE TROLLING CLUTCH MAY ENGAGE FULLY.

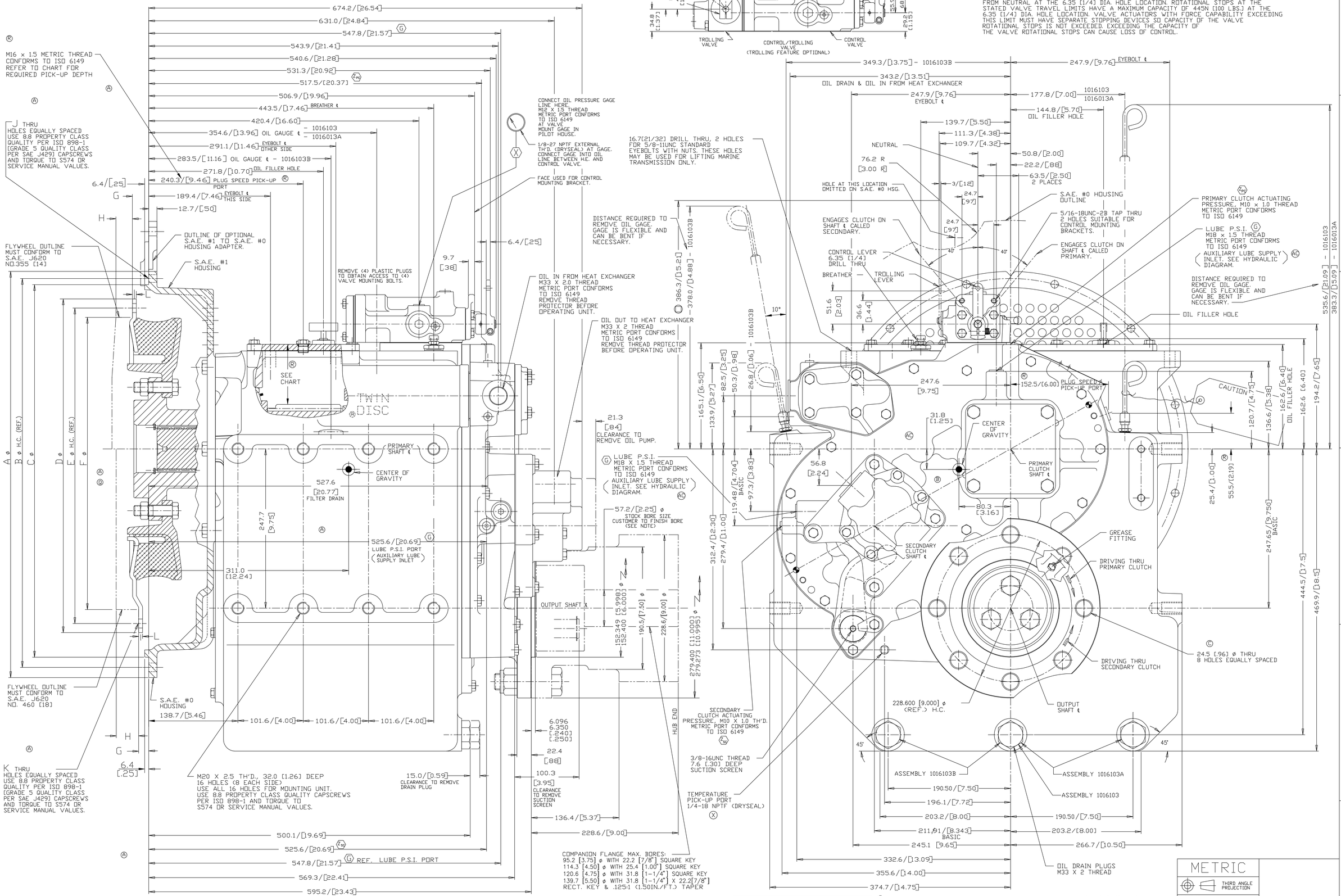
THE TROLLING LEVER ANGULAR LOCATION MAY BE ADJUSTED SO THAT THE 90° LEVER ROTATION REQUIRED FOR CONTROL FALLS ANYWHERE WITHIN THE 360° RANGE IN WHICH THE LEVER MAY BE LOCATED.




Ⓐ

CONTROL VALVE:

(AA) 18-62 N AT THE 56.0 [2.20]R LOCATION OF THE 6.35 [1/4] DIA. HOLE IS REQUIRED TO OVERCOME DETENT EFFORT. THE DETENT FEATURE IS PROVIDED IN THE FULL PRIMARY CLUTCH, FULL SECONDARY CLUTCH AND NEUTRAL LEVER POSITIONS. (THE DETENT SPRING AND PIN MAY BE OMITTED WHEN REMOTE CONTROL SYSTEMS PROVIDE THE PRIMARY, NEUTRAL AND SECONDARY DETENTS THAT CORRESPOND EXACTLY WITH VALVE DETENT POSITIONS. FORCE AT THE LEVER HOLE TO OPERATE THE VALVE THEN REDUCES TO 13-31N (3-7 LBS.) THE REMOTE CONTROL VALVE ACTUATOR MUST PROVIDE ±35.8 [1.41] LINEAR TRAVEL FROM NEUTRAL AT THE 6.35 [1/4] DIA. HOLE LOCATION. ROTATIONAL STOPS AT THE STATED VALVE TRAVEL LIMITS HAVE A MAXIMUM CAPACITY OF 445N (100 LBS.) AT THE 6.35 [1/4] DIA. HOLE LOCATION. VALVE ACTUATORS WITH FORCE CAPABILITY EXCEEDING THIS LIMIT MUST HAVE SEPARATE STOPPING DEVICES SO CAPACITY OF THE VALVE ROTATIONAL STOPS IS NOT EXCEEDED. EXCEEDING THE CAPACITY OF THE VALVE ROTATIONAL STOPS CAN CAUSE LOSS OF CONTROL.


674.2/[26.54]
631.0/[24.84]
547.8/[21.57]
543.9/[21.41]
540.6/[21.28]
531.3/[20.92]
517.5/[20.37]
506.9/[19.96]
443.5/[17.46] BREATHER ℄
420.4/[16.60]
354.6/[13.96] OIL GAUGE ℄ - 1016103 - 1016013A
291.1/[11.46] EYEBOLT ℄ OTHER SIDE
283.5/[11.16] OIL GAUGE ℄ - 1016103B
271.8/[10.70] OIL FILLER HOLE
240.3/[9.46] PLUG SPEED PICK-UP PORT
189.4/[7.46] EYEBOLT ℄ THIS SIDE
12.7/[.50]
M16 x 1.5 METRIC THREAD CONFORMS TO ISO 6149 REFER TO CHART FOR REQUIRED PICK-UP DEPTH
J THRU HOLES EQUALLY SPACED USE 8.8 PROPERTY CLASS QUALITY PER ISO 898-1 (GRADE 5 QUALITY CLASS PER SAE J429) CAPSCREWS AND TORQUE TO S574 OR SERVICE MANUAL VALUES.
6.4/[.25]
OUTLINE OF OPTIONAL S.A.E. #1 TO S.A.E. #0 HOUSING ADAPTER.
FLYWHEEL OUTLINE MUST CONFORM TO S.A.E. J620 NO. 355 [14]
S.A.E. #1 HOUSING
REMOVE (4) PLASTIC PLUGS TO OBTAIN ACCESS TO (4) VALVE MOUNTING BOLTS.
9.7 [.38]
6.4/[.25]
CONNECT OIL PRESSURE GAGE LINE HERE. M12 X 1.5 THREAD METRIC PORT CONFORMS TO ISO 6149 AT VALVE MOUNT GAGE IN PILOT HOUSE.
1/8-27 NPTF EXTERNAL TH'D. (DRYSEAL) AT GAGE. CONNECT GAGE INTO OIL LINE BETWEEN H.E. AND CONTROL VALVE.
FACE USED FOR CONTROL MOUNTING BRACKET.
OIL IN FROM HEAT EXCHANGER M33 X 2.0 THREAD METRIC PORT CONFORMS TO ISO 6149 REMOVE THREAD PROTECTOR BEFORE OPERATING UNIT.
OIL OUT TO HEAT EXCHANGER M33 X 2 THREAD METRIC PORT CONFORMS TO ISO 6149 REMOVE THREAD PROTECTOR BEFORE OPERATING UNIT.
SEE CHART
TWIN DISC
PRIMARY SHAFT ℄
CENTER OF GRAVITY
527.6 [20.77] FILTER DRAIN
247.7 [9.75]
525.6/[20.69] LUBE P.S.I. PORT (AUXILIARY LUBE SUPPLY INLET
311.0 [12.24]
21.3 [.84] CLEARANCE TO REMOVE OIL PUMP.
LUBE P.S.I. M18 X 1.5 THREAD METRIC PORT CONFORMS TO ISO 6149 AUXILIARY LUBE SUPPLY INLET. SEE HYDRAULIC DIAGRAM. (AC)
57.2/[2.25] ø STOCK BORE SIZE CUSTOMER TO FINISH BORE (SEE NOTE)
OUTPUT SHAFT ℄
152.349 [5.998] ø 152.400 [6.000] ø
190.5/[7.50] ø
228.6/[9.00] ø
279.400 [11.000] ø 279.273 [10.995] ø
HUB END
SECONDARY CLUTCH ACTUATING PRESSURE, M10 X 1.0 TH'D. METRIC PORT CONFORMS TO ISO 6149
3/8-16UNC THREAD 7.6 [.30] DEEP SUCTION SCREEN
TEMPERATURE PICK-UP PORT 1/4-18 NPTF (DRYSEAL) (X)
6.096 6.350 [.240] [.250]
22.4 [.88]
100.3 [3.95] CLEARANCE TO REMOVE SUCTION SCREEN
15.0/[0.59] CLEARANCE TO REMOVE DRAIN PLUG
M20 X 2.5 TH'D., 32.0 [1.26] DEEP 16 HOLES (8 EACH SIDE) USE ALL 16 HOLES FOR MOUNTING UNIT. USE 8.8 PROPERTY CLASS QUALITY CAPSCREWS PER ISO 898-1 AND TORQUE TO S574 OR SERVICE MANUAL VALUES.
K THRU HOLES EQUALLY SPACED USE 8.8 PROPERTY CLASS QUALITY PER ISO 898-1 (GRADE 5 QUALITY CLASS PER SAE J429) CAPSCREWS AND TORQUE TO S574 OR SERVICE MANUAL VALUES.
FLYWHEEL OUTLINE MUST CONFORM TO S.A.E. J620 NO. 460 [18]
S.A.E. #0 HOUSING
138.7/[5.46]
101.6/[4.00]
101.6/[4.00]
101.6/[4.00]
6.4 [.25]
500.1/[19.69]
525.6/[20.69]
547.8/[21.57] REF. LUBE P.S.I. PORT
569.3/[22.41]
595.2/[23.43]
386.3/[15.21] - 1016103B
378.0/[14.88] - 1016103B
DISTANCE REQUIRED TO REMOVE OIL GAGE. GAGE IS FLEXIBLE AND CAN BE BENT IF NECESSARY.
10°
165.1/[6.50]
133.9/[5.27]
82.5/[3.25]
50.3/[1.98]
26.8/[1.06] - 1016103B
119.48/[4.704] BASIC
97.3/[3.83]
312.4/[12.30]
279.4/[11.00]
56.8 [2.24]
COMPANION FLANGE MAX. BORES:
95.2 [3.75] ø WITH 22.2 [7/8"] SQUARE KEY
114.3 [4.50] ø WITH 25.4 [1.00"] SQUARE KEY
120.6 [4.75] ø WITH 31.8 [1-1/4"] SQUARE KEY
139.7 [5.50] ø WITH 31.8 [1-1/4"] X 22.2[7/8"] RECT. KEY & .125:1 (1.50IN./FT.) TAPER
349.3/[13.75] - 1016103B
343.2/[13.51] OIL DRAIN & OIL IN FROM HEAT EXCHANGER
247.9/[9.76] EYEBOLT ℄
247.9/[9.76] EYEBOLT ℄
177.8/[7.00] 1016103 1016013A
144.8/[5.70] OIL FILLER HOLE
139.7/[5.50]
111.3/[4.38]
109.7/[4.32]
NEUTRAL
76.2 R [3.00 R]
50.8/[2.00]
22.2/[.88]
63.5/[2.50] 2 PLACES
HOLE AT THIS LOCATION OMITTED ON S.A.E. #0 HSG.
3/[.12]
24.7 [.97]
S.A.E. #0 HOUSING OUTLINE
16.7[21/32] DRILL THRU, 2 HOLES FOR 5/8-11UNC STANDARD EYEBOLTS WITH NUTS. THESE HOLES MAY BE USED FOR LIFTING MARINE TRANSMISSION ONLY.
ENGAGES CLUTCH ON SHAFT ℄ CALLED SECONDARY.
5/16-18UNC-2B TAP THRU 2 HOLES SUITABLE FOR CONTROL MOUNTING BRACKETS.
LUBE P.S.I. (G) M18 x 1.5 THREAD METRIC PORT CONFORMS TO ISO 6149 AUXILIARY LUBE SUPPLY INLET. SEE HYDRAULIC DIAGRAM. (AC)
CONTROL LEVER 6.35 [1/4] DRILL THRU
ENGAGES CLUTCH ON SHAFT ℄ CALLED PRIMARY.
BREATHER
TROLLING LEVER
51.6 [2.03]
36.6 [1.44]
DISTANCE REQUIRED TO REMOVE OIL GAGE. GAGE IS FLEXIBLE AND CAN BE BENT IF NECESSARY.
535.6/[21.09] - 1016103 383.3/[15.09] - 1016013A
OIL FILLER HOLE
247.6 [9.75]
152.5/[6.00] PLUG SPEED PICK-UP PORT
CAUTION
120.7/[4.75]
136.6/[5.38]
162.6/[6.40]
OIL FILLER HOLE
162.6 [6.40]
194.2/[7.65]
31.8 [1.25]
CENTER OF GRAVITY
PRIMARY CLUTCH SHAFT ℄
80.3 [3.16]
25.4/[1.00]
55.5/[2.19]
247.65/[9.750] BASIC
444.5/[17.5]
469.9/[18.5]
GREASE FITTING
SECONDARY CLUTCH SHAFT ℄
DRIVING THRU PRIMARY CLUTCH
DRIVING THRU SECONDARY CLUTCH
24.5 [.96] ø THRU 8 HOLES EQUALLY SPACED
228.600 [9.000] ø (REF.) H.C.
OUTPUT SHAFT ℄
45°
ASSEMBLY 1016103B
ASSEMBLY 1016103A
ASSEMBLY 1016103
190.50/[7.50]
196.1/[7.72]
203.2/[8.00]
190.50/[7.50]
211.91/[8.343] BASIC
203.2/[8.00]
245.1 [9.65]
266.7/[10.50]
332.6/[13.09]
355.6/[14.00]
374.7/[14.75]
OIL DRAIN PLUGS M33 X 2 THREAD

| SIZE | S.A.E. J620 MARINE TRANSMISSION FLYWHEEL NO. | A | B | C ±0.000 (±.000") | D ±0.000 (±.000") | E | F | G | H | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 460 [18] | 711.2 (28.00") | 679.45 (26.750") | 647.70 (25.500") | 571.50 (22.500") | 342.92 (21.375") | 498.3 (19.62") | 15.7 (.62") | 35.0 (1.38") | 15 OF 19.5 (17/32) | 6 OF 16.7 (.66") | 6.0 (.24") |
| 1 | 355 [14] | 552.4 (21.75") | 530.20 (20.875") | 511.17 (20.125") | 466.72 (18.375") | 438.15 (17.250") | 409.4 (16.12") | 25.4 (1.00") | 25.7 (1.01") | 15 OF 19.5 (15/32) | 8 OF 13.5 (.53") | 6.3 (.25") |

(Q) OPTIONAL TEMPERATURE INDICATING SWITCH: CUSTOMER TO INSTALL IN A [3/4 X 3/4 X 3/4] PIPE TEE IN THE HYDRAULIC LINE LEADING FROM THE MARINE TRANSMISSION PUMP TO THE HEAT EXCHANGER INLET. REFER TO HYDRAULIC DIAGRAM.

NOTE: ALL POINTS AVAILABLE FOR TESTING ARE CODED (Q).

| TRANSFER GEAR | GEAR SETS | DIM. FROM PORT S'FACE - PINION O.D. |
|---|---|---|
| 32.9 [1.3] | 3.48:1 | 100.5 [4.0] |
| | 2.92:1 | 92.8 [3.7] |
| | 2.48:1 | 85.3 [3.4] |
| | 2.03:1 | 75.0 [3.0] |
| | 1.76:1 | 67.1 [2.6] |
| | 1.53:1 | 59.0 [2.3] |
| | 1.33:1 | 51.6 [2.0] |
| | 1.17:1 | 43.0 [1.7] |

INCH DIMENSIONS AND POUNDS SHOWN IN BRACKETS [ ]

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| | |
|---|---|
| MATERIAL | |
| HEAT TREAT | |
| SURFACE TREATMENT | |
| WEIGHT kg | VR* N.A.* |
| FIRST USE | |
| ASSY. | |
| MODEL | |
| NAME | MARINE TRANSMISSION MG5202(SC) |

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

| | |
|---|---|
| DATE | 3-9-95 |
| SCALE | .50=1mm |
| DRN. | AZ |
| CHK. | DAS |
| APPD. | TBC |

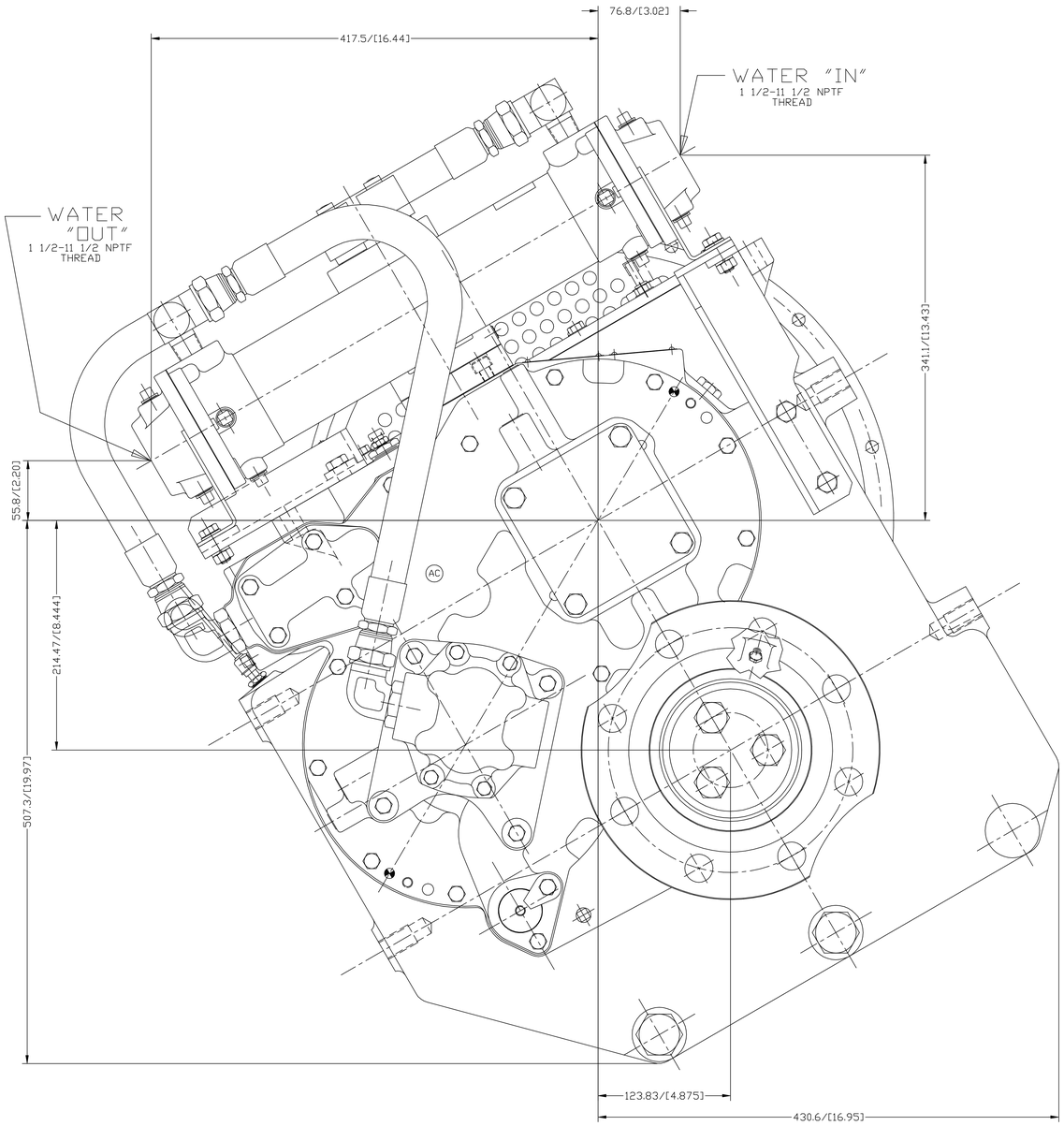
TWIN DISC INCORPORATED RACINE, WI 53403 - USA

1016103
1016103A
1016103B

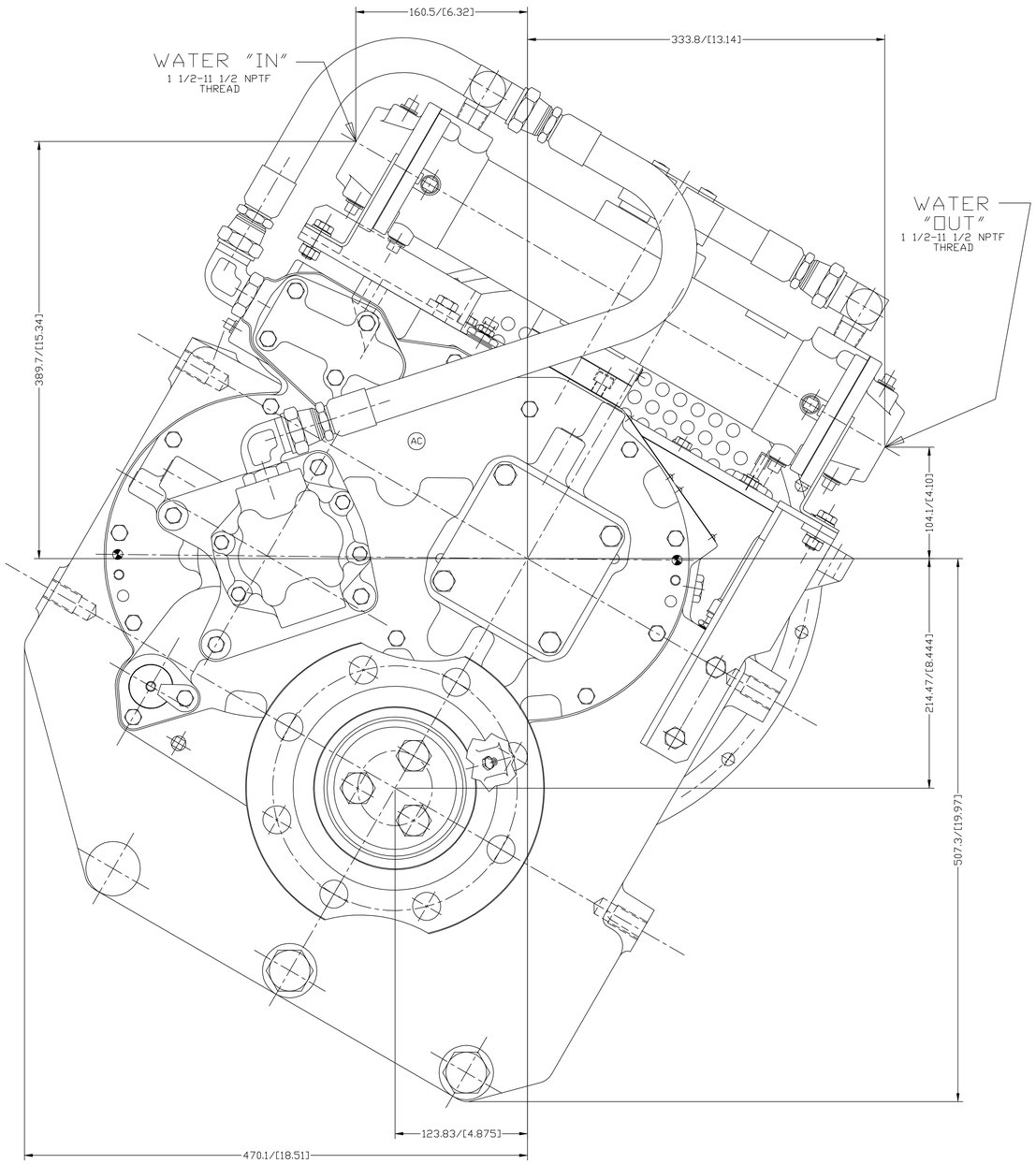
SHEET 2 OF 5 REV AD

6 5 4 3 2 1

E D C B A




ASSEMBLY 1016103B




ASSEMBLY 1016103A

METRIC

THIRD ANGLE PROJECTION

SIMILAR TO

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MATERIAL

HEAT TREAT

SURFACE TREATMENT

WEIGHT LBS. | WR² LBS. IN²

FIRST USE
ASSY.
MODEL

NAME
MG5202(SC) MARINE TRANSMISSION

UNLESS OTHERWISE SPECIFIED
MACHINED DIMENSIONS
X.X ±0.030
X.XX ±0.010
X.XXX ±0.005
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 3-9-95
SCALE .50 =1
DRN. AZ
CHK. DAS
APPD. TBC

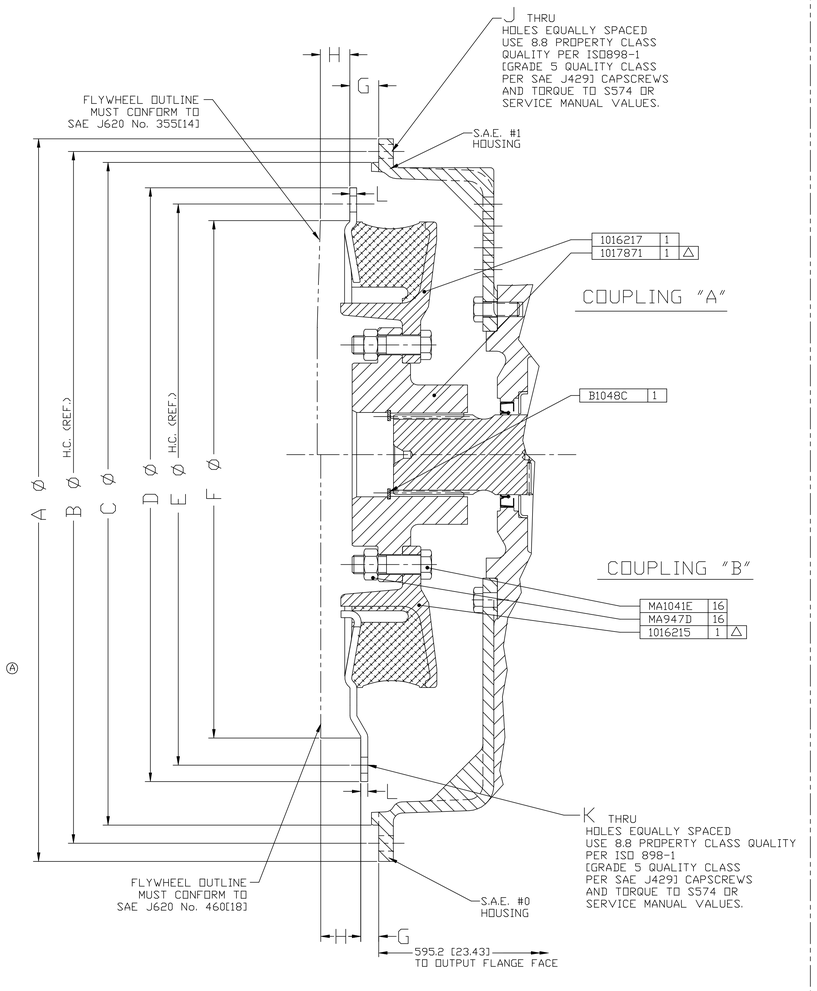
TWIN DISC INCORPORATED RACINE, WI 53403 - USA

1016103
1016103A
1016103B

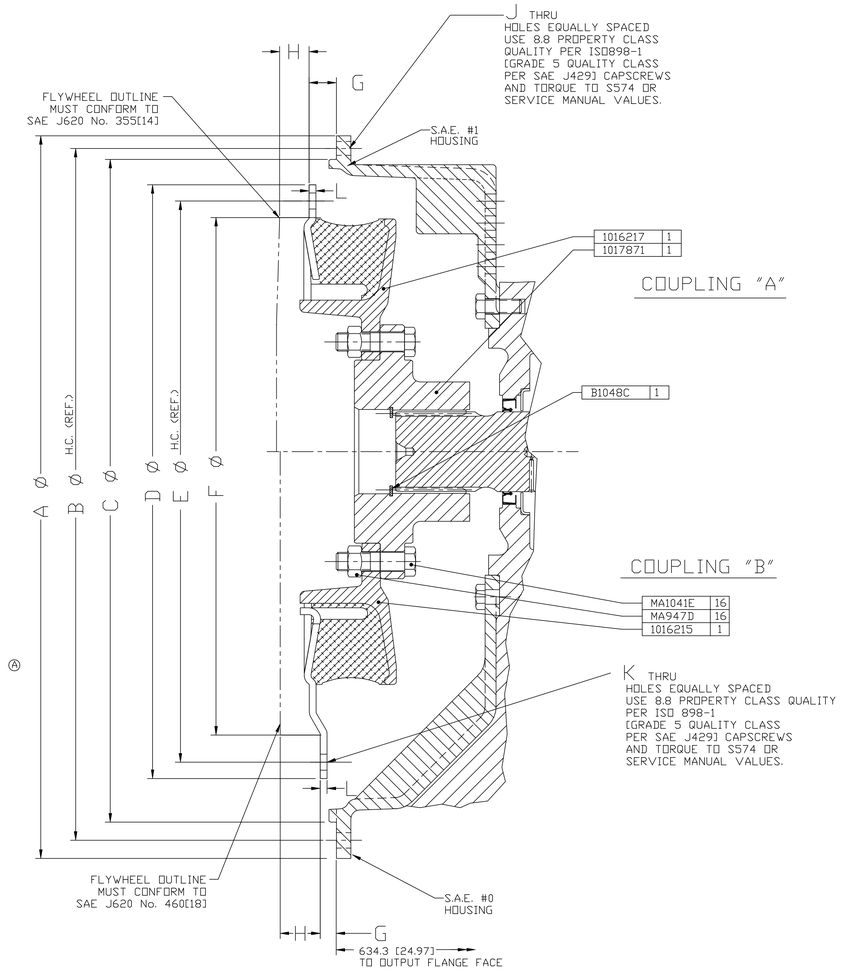
SHEET 3 OF 5 REV AD

E D C B A

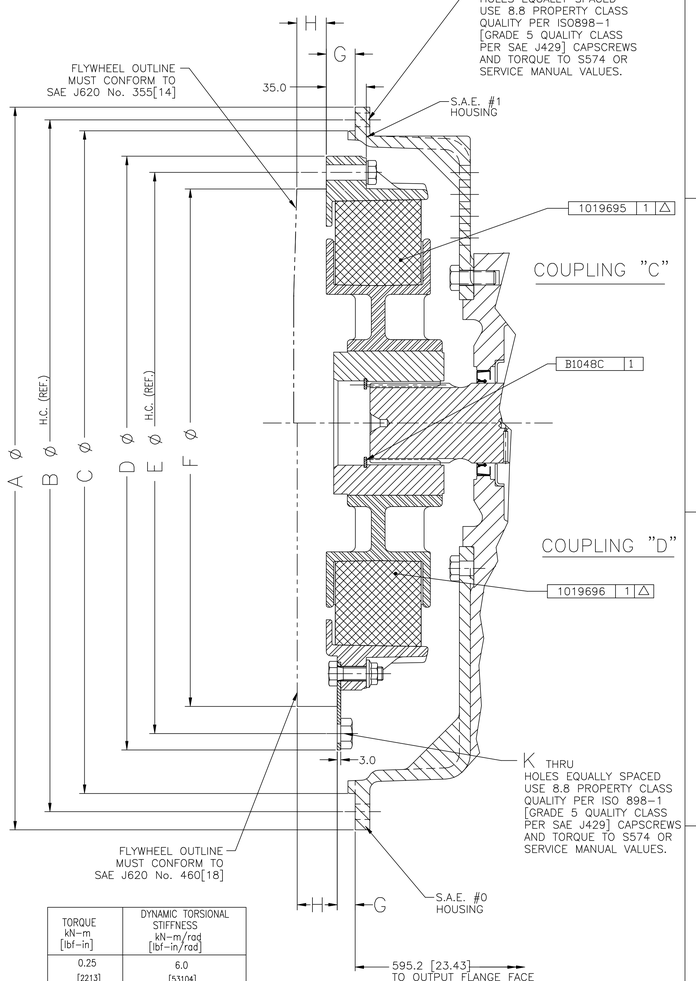
6 5 4 3 2 1




STANDARD 1016103 ASSEMBLY ARRANGEMENT




OPTION ARRANGEMENT WHERE ASSEMBLY
1016103 REPLACES ASSEMBLY 1014841.




| TORQUE kN-m [lbf-in] | DYNAMIC TORSIONAL STIFFNESS kN-m/rad [lbf-in/rad] |
|---|---|
| 0.25 [2213] | 6.0 [53104] |
| 0.50 [4425] | 12.0 [106209] |
| 1.25 [11063] | 31.0 [274373] |
| 2.50 [22127] | 68.0 [601851] |
| 3.75 [33190] | 113.0 [1000135] |
| 5.00 [44254] | 165.0 [1460373] |

Ⓐ3

| COUPLING | SAE J620 FLYWHEEL SIZE | COUPLING NO. | MAX. COUPLING rpm* | NOMINAL TORQUE kN-m [lbf-in] | DYNAMIC TORSIONAL STIFFNESS | COUPLING WR² kg-m² [lb-in²] ** OUTER PARTS | COUPLING WR² kg-m² [lb-in²] ** INNER PARTS | COUPLING WEIGHT kg [lb] |
|---|---|---|---|---|---|---|---|---|
| C | NO. 355 [14] | CF-R-308-014 -60011-HR | 3000 | 5.00 [44,254] | PER CHART | 0.206 [704] | 0.166 [567] | 25 [55] |
| D | NO. 460 [18] | CF-R-308-018 -60012-HR | 2800 | 5.00 [44.254] | PER CHART | 0.290 [991] | 0.166 [567] | 27 [60] |

Ⓟ

| TORQUE kN-m [lbf-in] | DYNAMIC TORSIONAL STIFFNESS kN-m/rad [lbf-in/rad] |
|---|---|
| 0.50 [4400] | 19.4 [172000] |
| 1.25 [11100] | 19.9 [176000] |
| 2.50 [22100] | 23.1 [204000] |
| 3.75 [33200] | 33.9 [300000] |
| 5.00 [44200] | 47.0 [416000] |

Ⓐ

| COUPLING | SAE J620 FLYWHEEL SIZE | COUPLING NO. | MAX. COUPLING rpm* | NOMINAL TORQUE kN-m [lbf-in] | DYNAMIC TORSIONAL STIFFNESS | COUPLING WR² kg-m² [lb-in²] ** OUTER PARTS | COUPLING WR² kg-m² [lb-in²] ** INNER PARTS | COUPLING WEIGHT kg [lb] WITHOUT HUB | COUPLING WEIGHT kg [lb] WITH HUB |
|---|---|---|---|---|---|---|---|---|---|
| A | NO. 355 [14] | VKE 4911S -4000/14 | 2750 | 5.00 [44250] | PER CHART | 0.24 [820] | 0.40 [1383] | 23.7 [52.2] | 36.7 [76.6] |
| B | NO. 460 [18] | VKE 4911S -4000/18 | 2750 | 5.00 [44250] | PER CHART | 0.61 [2084] | 0.40 [1383] | 27.7 [61.1] | 40.7 [85.4] |

Ⓐ

| SAE NO | S.A.E. J620 MARINE TRANSMISSION FLYWHEEL NO. | A | B | C +0.000 -0.127 | D +0.000 -0.102 | E | F | G | H | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 355 [14] | 552,4 [21.75] | 530,20 [20.875] | 511,17 [20.125] | 466,725 [18.375] | 438,15 [17.250] | 409,4 [16.12] | 25.4 [1.00] | 25.7 [1.01] | 12 DF 11.2 [15/32] | 8 DF 13.5 [.532] | 6.3 [.25] | 304.8 [.12] |
| 0 | 460 [18] | 711,2 [28.00] | 679,45 [26.750] | 647,70 [25.500] | 571,50 [22.500] | 542,92 [21.375] | 498,3 [19.62] | 15.7 [.62] | 35.0 [1.38] | 15 DF 13.5 [17/32] | 6 DF 16.7 [.66] | 6.0 [.24] | 304.8 [.12] |

Ⓐ3

| OBSOLETE COUPLINGS | | | | | |
|---|---|---|---|---|---|
| COUPLING | REFER TO DRAWING BELOW FOR TECHNICAL INFORMATION | SAE J620 FLYWHEEL SIZE | WR² kg-m² [lb-in²] PRIMARY | WR² kg-m² [lb-in²] ** SECONDARY | COUPLING WEIGHT kg [lb] |
| CF-DS-59-7-3 -014-0933S | 1016385 | NO. 355 [14] | 0.16 [547] | 0.61 [2081] | 24.4 [53.8] |
| CF-DS-59-7-3 -018-0936S | 1016386 | NO. 460 [18] | 0.24 [820] | 0.61 [2081] | 27.5 [60.6] |

Ⓐ3

FOR TRANSMISSION/COUPLING ASSEMBLY TO ENGINE:
INSTALL COUPLING AND HUB TO ENGINE FLYWHEEL.
ADVANCE MARINE TRANSMISSION INTO POSITION WITH ENGINE FLYWHEEL HOUSING MOUNTING FLANGE. LINE UP INPUT SHAFT EXTERNAL SPLINE WITH INTERNAL SPLINE IN COUPLING HUB AND MOVE ENGINE AND MARINE TRANSMISSION TOGETHER MAINTAINING ENGINE FLYWHEEL HOUSING AND MARINE TRANSMISSION FLYWHEEL HOUSING MOUNTING FACES IN PARALLEL RELATIONSHIP. ENGAGE FLYWHEEL HOUSING PILOTS AND INSTALL ALL MOUNTING CAPSCREWS USING 8.8 PROPERTY CLASS QUALITY PER ISO 898-1 [GRADE 5 QUALITY CAPSCREWS PER S.A.E. J429] TORQUED TO S574 OR SERVICE MANUAL VALUES.

* SEE SHEET 1 FOR MAXIMUM TRANSMISSION R.P.M.

** THE $WR^2$ OF THE INNER/SECONDARY PARTS INCLUDES HUB AND 1/4 SHAFT $C_2$.

FOR OTHER TRANSMISSION MASS ELASTIC DATA, REFER TO B3504AE.

FOR OTHER TRANSMISSION INSTALLATION DIMENSIONS, REFER TO 1016103, SHEET 2.

ALL COUPLINGS ABOVE HAVE TORSIONAL STOP INCLUDED.

△ FOR TRANSMISSION SHIPMENT: SECURE FLEXIBLE COUPLING TO HOUSING S.A.E. FLANGE HOLES, USING STANDARD METHOD, BEFORE SHIPMENT OF UNIT.

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MATERIAL
HEAT TREAT
SURFACE TREATMENT
WEIGHT LBS. | $WR^2$ LBS. IN²
FIRST USE
ASSY.
MODEL
NAME MG5202(SC) MARINE TRANSMISSION
UNLESS OTHERWISE SPECIFIED
MACHINED DIMENSIONS XX ±0.030 XXX ±0.010 XXXX ±0.005
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982
DATE 3-9-95
SCALE .50 =1
DRN. AZ
CHK'C. DAS
APP'D. TBC

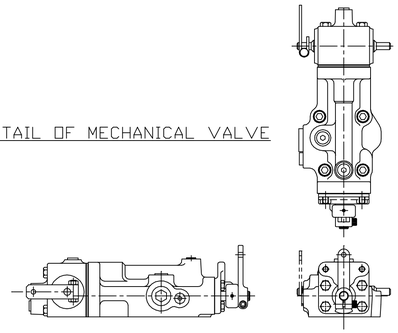
METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

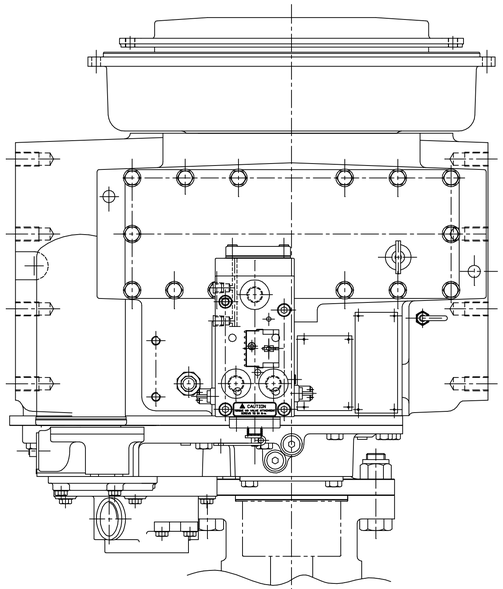
TWIN DISC INCORPORATED RACINE, WI 53403 - USA

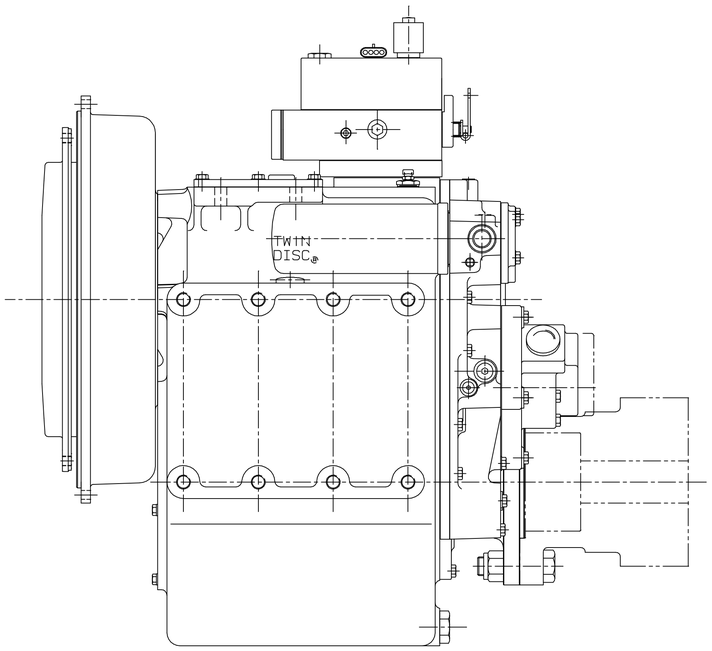
1016103
1016103A
1016103B

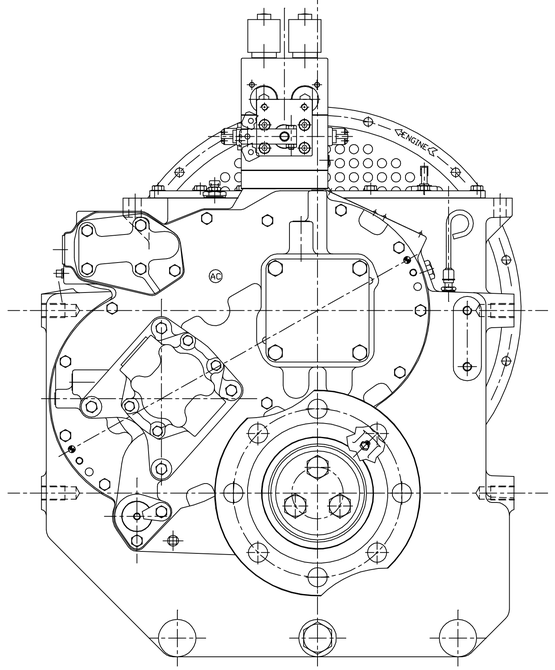
SHEET 4 OF 5 Ⓟ REV AD

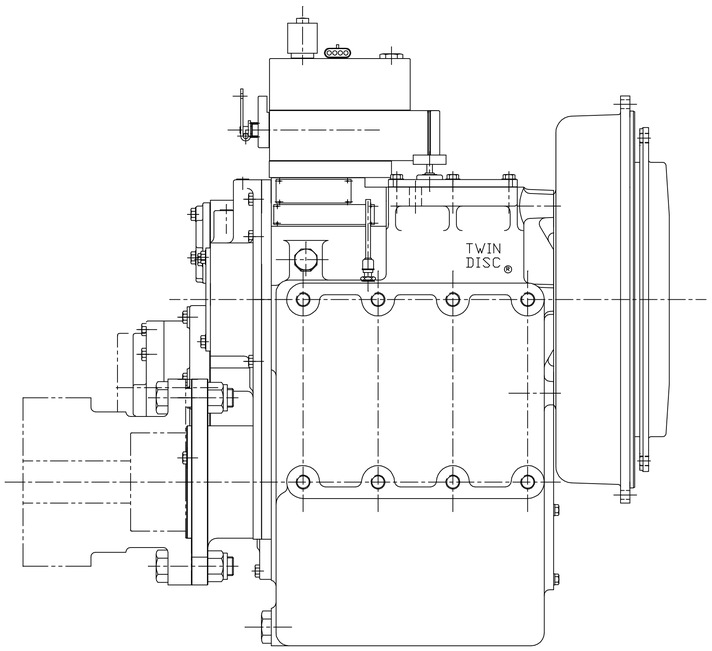
DETAIL OF MECHANICAL VALVE










# ASSEMBLY 1016103

METRIC

THIRD ANGLE PROJECTION

SIMILAR TO

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| | |
|---|---|
| MATERIAL | |
| HEAT TREAT | |
| SURFACE TREATMENT | |
| WEIGHT LBS. | WR² LBS. IN² |
| FIRST USE ASSY. | |
| MODEL | |
| NAME | MG5202 (S.C.) MARINE TRANSMISSION |

UNLESS OTHERWISE SPECIFIED
MACHINED DIMENSIONS
X.X ±0.030
X.XX ±0.010
X.XXX ±0.005
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

| | |
|---|---|
| DATE | 8-28-95 |
| SCALE | .25=1.00 |
| DRN. | KDS |
| CHK. | DAS |
| APPD. | DAS |

TWIN DISC INCORPORATED
RACINE, WI 53403 - USA

10161103
10161103A
10161103B

SHEET 5 OF 5 REV AD

6 5 4 3 2 1

F E D C B A

## ASSEMBLY INSTRUCTIONS:

ASSEMBLE AND TEST PER S570AE.
NOTES #1 THRU #8 ARE IN S570AE.

## THESE STANDARDS APPLY:

S574 FASTENER TORQUE REQUIREMENTS
S692 BEARING SHIMMING
S765 TAPERED JOINT ASSEMBLY

XA7540C
CONTROL VALVE ASSEMBLY

FILTER BY-PASS

| | |
|---|---|
| MA217H | 2 |
| B1048BB | 2 |
| M2693P | 2 |
| 1015361 | 1 |
| ✱ 1015360 | 1 |
| MA1034B STEEL BALL | 1 |
| M2943 THIS BEARING USED WITH 3.48:1 RATIO ONLY | 2 |
| M2795 | 2 |

| | |
|---|---|
| 1016333 | 2 |
| 3.48:1 RATIO | 21 T |
| 1016330 | 2 |
| 2.92:1 RATIO | 24 T |
| 1016328 | 2 |
| 2.48:1 RATIO | 27 T |
| 1016324 | 2 |
| 2.03:1 RATIO | 31 T |
| 1016322 | 2 |
| 1.76:1 RATIO | 33 T |
| 1016320 | 2 |
| 1.53:1 RATIO | 36 T |
| 1018492 | 2 |
| 1.33:1 RATIO | 39 T |
| 1016318 | 2 |
| 1.17:1 RATIO | 42 T |

| | | |

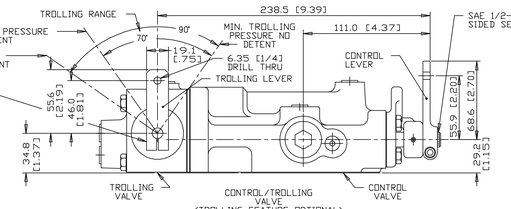
(OPTIONAL) TROLLING VALVE INSTALLATION AND OPERATING NOTES:

1) REFER TO VALVE ASSEMBLY DRAWING FOR ADDITIONAL INSTALLATION NOTES. CONTROL HEAD FOR TROLLING VALVE MUST INCLUDE A DEVICE TO LOCK TROLLING VALVE CONTROL LEVER IN THE DETENTED NO-TROLL POSITION DURING MANEUVERING, DOCKING AND OTHER OPERATING CONDITIONS THAT REQUIRE FULL POWER TO THE PROPELLER.

2) MAXIMUM ENGINE SPEED WHILE TROLLING 1100 RPM OR 60% OF FULL-LOAD ENGINE SPEED, WHICHEVER IS SMALLER.

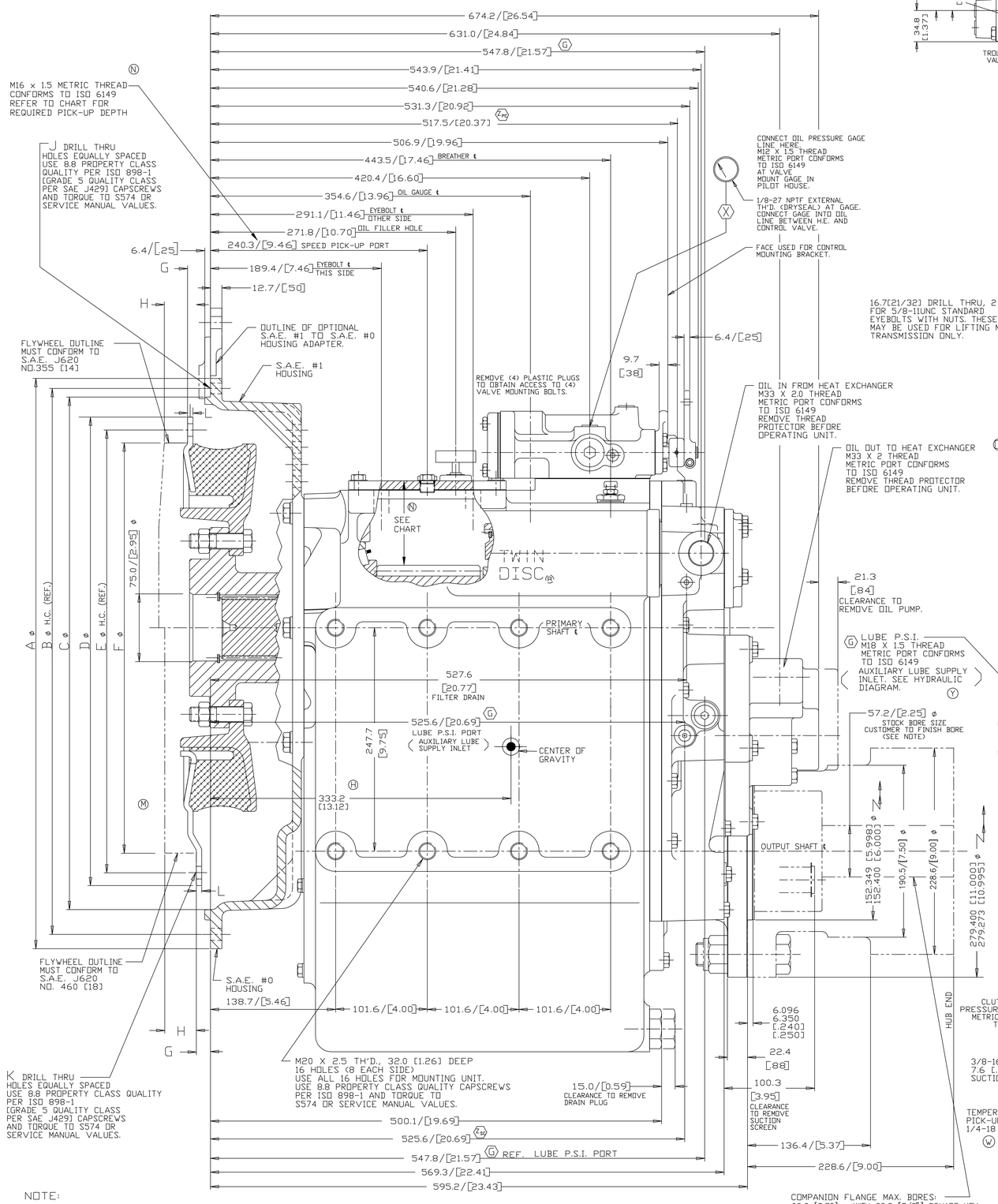
3) WITH CONTROL VALVE LEVER IN NEUTRAL, SELECT TROLLING FUUCTION BY MOVING TROLLING CONTROL LEVER OUT OF LOCKED DETENTED POSITION TO MAXIMUM TROLLING POSITION. SELECT TROLLING DIRECTION OF TRAVEL BY MOVING CONTROL VALVE LEVER TO THE PRIMARY CLUTCH OR SECONDARY CLUTCH POSITION. MOVE TROLLING CONTROL LEVER FROM MINIMUM TROLLING POSITION TO SELECT DESIRED TROLLING SPEED. WHEN TROLLING LEVER IS ADVANCED CLOSE TO DETENTED NO-TROLL POSITION, THE TROLLING CLUTCH MAY ENGAGE FULLY.

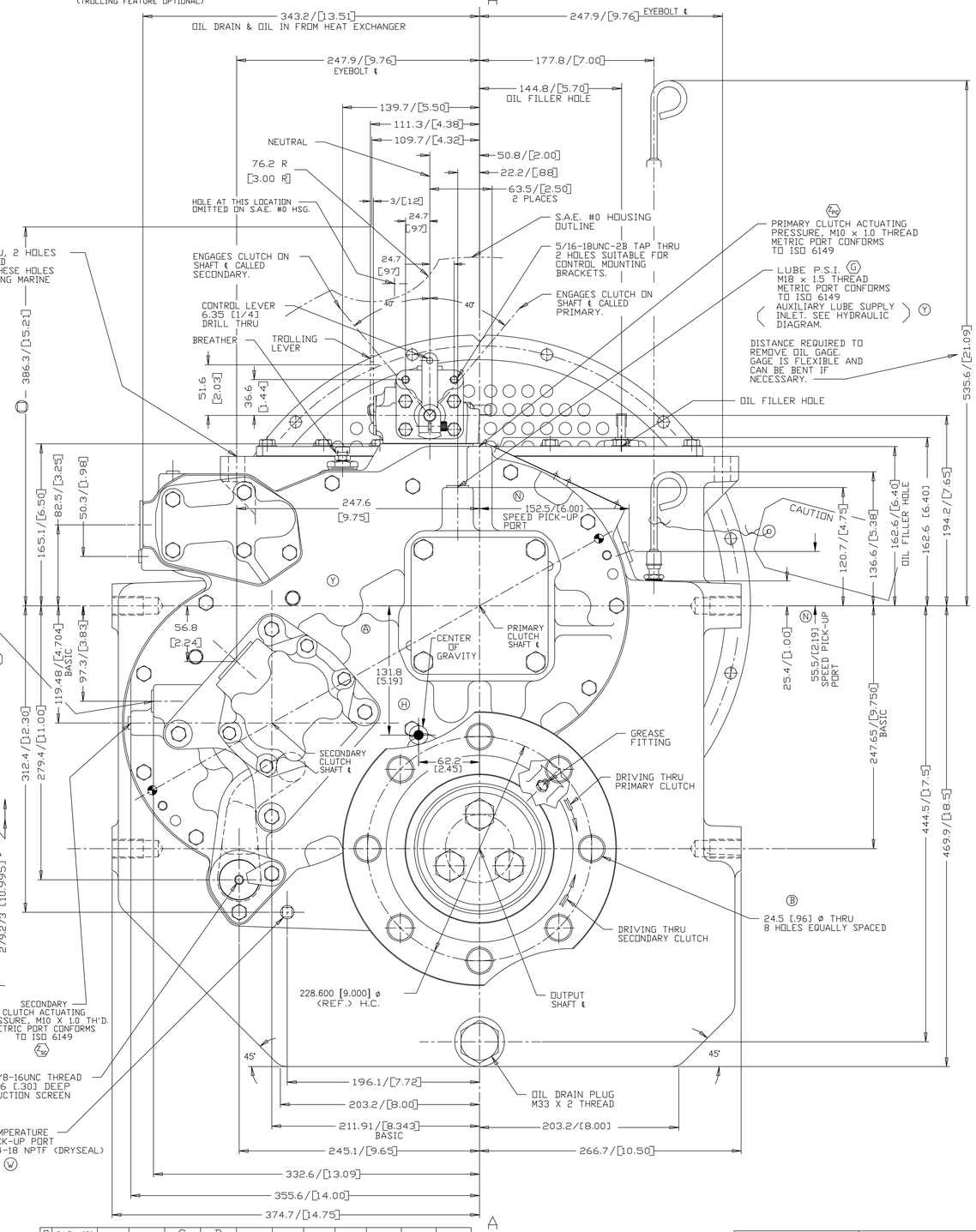
THE TROLLING LEVER ANGULAR LOCATION MAY BE ADJUSTED SO THAT THE 90° LEVER ROTATION REQUIRED FOR CONTROL FALLS ANYWHERE WITHIN THE 360° RANGE IN WHICH THE LEVER MAY BE LOCATED.




(X) CONTROL VALVE:
18-62 (4-14 lbs.) AT THE 56.0 (2.20) R LOCATION OF THE 6.35 (1/4) DIA. HOLE IS REQUIRED TO OVERCOME DETENT EFFORT. THE DETENT FEATURE IS PROVIDED IN THE FULL PRIMARY CLUTCH, FULL SECONDARY CLUTCH AND NEUTRAL LEVER POSITIONS. (THE DETENT SPRING AND PIN MAY BE OMITTED WHEN REMOTE CONTROL SYSTEMS PROVIDE THE PRIMARY, NEUTRAL AND SECONDARY DETENTS THAT CORRESPOND EXACTLY WITH VALVE DETENT POSITIONS. FORCE AT THE LEVER HOLE TO OPERATE THE VALVE THEN REDUCES TO 13-31N (3-7 LBS.) THE REMOTE CONTROL VALVE ACTUATOR MUST PROVIDE ±35.8 [1.41] LINEAR TRAVEL FROM NEUTRAL AT THE 6.35 (1/4) DIA. HOLE LOCATION. ROTATIONAL STOPS AT THE STATED VALVE TRAVEL LIMITS HAVE A MAXIMUM CAPACITY OF 445N (100 LBS.) AT THE 6.35 (1/4) DIA. HOLE LOCATION. VALVE ACTUATORS WITH FORCE CAPABILITY EXCEEDING THIS LIMIT MUST HAVE SEPARATE STOPPING DEVICES SO CAPACITY OF THE VALVE ROTATIONAL STOPS IS NOT EXCEEDED. EXCEEDING THE CAPACITY OF THE VALVE ROTATIONAL STOPS CAN CAUSE LOSS OF CONTROL.

| HEAT EXCHANGER (H.E.) REQUIREMENTS |
|---|
| REFER TO B3649K FOR HEAT EXCHANGER DATA. |


674.2/[26.54]
631.0/[24.84]
547.8/[21.57]
543.9/[21.41]
540.6/[21.28]
531.3/[20.92]
517.5/[20.37]
506.9/[19.96]
443.5/[17.46] BREATHER ℄
420.4/[16.60]
354.6/[13.96] OIL GAUGE ℄
291.1/[11.46] EYEBOLT ℄ OTHER SIDE
271.8/[10.70] OIL FILLER HOLE
240.3/[9.46] SPEED PICK-UP PORT
189.4/[7.46] EYEBOLT ℄ THIS SIDE
12.7/[.50]
M16 x 1.5 METRIC THREAD CONFORMS TO ISO 6149 REFER TO CHART FOR REQUIRED PICK-UP DEPTH
J DRILL THRU HOLES EQUALLY SPACED USE 8.8 PROPERTY CLASS QUALITY PER ISO 898-1 (GRADE 5 QUALITY CLASS PER SAE J429) CAPSCREWS AND TORQUE TO S574 OR SERVICE MANUAL VALUES.
6.4/[.25]
OUTLINE OF OPTIONAL S.A.E. #1 TO S.A.E. #0 HOUSING ADAPTER.
FLYWHEEL OUTLINE MUST CONFORM TO S.A.E. J620 NO.355 [14]
S.A.E. #1 HOUSING
REMOVE (4) PLASTIC PLUGS TO OBTAIN ACCESS TO (4) VALVE MOUNTING BOLTS.
CONNECT OIL PRESSURE GAGE LINE HERE. M12 X 1.5 THREAD METRIC PORT CONFORMS TO ISO 6149 AT VALVE MOUNT GAGE IN PILOT HOUSE.
1/8-27 NPTF EXTERNAL TH'D. (DRYSEAL) AT GAGE. CONNECT GAGE INTO OIL LINE BETWEEN H.E. AND CONTROL VALVE.
FACE USED FOR CONTROL MOUNTING BRACKET.
9.7 [.38]
6.4/[.25]
OIL IN FROM HEAT EXCHANGER M33 X 2.0 THREAD METRIC PORT CONFORMS TO ISO 6149 REMOVE THREAD PROTECTOR BEFORE OPERATING UNIT.
OIL OUT TO HEAT EXCHANGER M33 X 2 THREAD METRIC PORT CONFORMS TO ISO 6149 REMOVE THREAD PROTECTOR BEFORE OPERATING UNIT.
SEE CHART
TWIN DISC
21.3 [.84] CLEARANCE TO REMOVE OIL PUMP.
PRIMARY SHAFT ℄
LUBE P.S.I. M18 X 1.5 THREAD METRIC PORT CONFORMS TO ISO 6149 AUXILIARY LUBE SUPPLY INLET. SEE HYDRAULIC DIAGRAM.
57.2/[2.25] ø STOCK BORE SIZE CUSTOMER TO FINISH BORE (SEE NOTE)
527.6 [20.77] FILTER DRAIN
525.6/[20.69]
LUBE P.S.I. PORT (AUXILIARY LUBE SUPPLY INLET)
247.7 [9.75]
CENTER OF GRAVITY
333.2 [13.12]
OUTPUT SHAFT ℄
152.349 [5.998] ø
152.400 [6.000] ø
190.5/[7.50] ø
228.6/[9.00] ø
279.400 [11.0001] ø
279.273 [10.9951] ø
HUB END
A ø H.C. (REF.)
B ø H.C. (REF.)
C ø
D ø H.C. (REF.)
E ø
F ø
75.0/[2.95] ø
FLYWHEEL OUTLINE MUST CONFORM TO S.A.E. J620 NO. 460 [18]
S.A.E. #0 HOUSING
138.7/[5.46]
101.6/[4.00]
101.6/[4.00]
101.6/[4.00]
H
G
K DRILL THRU HOLES EQUALLY SPACED USE 8.8 PROPERTY CLASS QUALITY PER ISO 898-1 (GRADE 5 QUALITY CLASS PER SAE J429) CAPSCREWS AND TORQUE TO S574 OR SERVICE MANUAL VALUES.
M20 X 2.5 TH'D., 32.0 [1.26] DEEP 16 HOLES (8 EACH SIDE) USE ALL 16 HOLES FOR MOUNTING UNIT. USE 8.8 PROPERTY CLASS QUALITY CAPSCREWS PER ISO 898-1 AND TORQUE TO S574 OR SERVICE MANUAL VALUES.
15.0/[0.59] CLEARANCE TO REMOVE DRAIN PLUG
6.096
6.350 [.240] [.250]
22.4 [.88]
100.3 [3.95] CLEARANCE TO REMOVE SUCTION SCREEN
500.1/[19.69]
525.6/[20.69]
547.8/[21.57] REF. LUBE P.S.I. PORT
569.3/[22.41]
595.2/[23.43]
136.4/[5.37]
228.6/[9.00]




| SAE NO | S.A.E. J620 MARINE TRANSMISSION FLYWHEEL NO. | A | B | C +0.000 -0.127 (+.000-.005) | D +0.000 -0.102 (+.000-.004) | E | F | G | H | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 460 [18] | 711.2 (28.00) | 679.45 (26.750) | 647.70 (25.500) | 571.50 (22.500) | 542.92 (21.375) | 498.3 (19.62) | 15.7 (.62) | 35.0 (1.38) | 16.0° 13.5 (17/32) | 6.0° 16.7 (.66) | 6.0 (.24) |
| 1 | 355 [14] | 552.4 (21.75) | 530.20 (20.875) | 511.17 (20.125) | 466.72 (18.375) | 438.15 (17.250) | 409.4 (16.12) | 25.4 (1.00) | 25.7 (1.01) | 18.0° 11.9 (15/32) | 8.0° 19.5 (.53) | 12.0 (.25) |

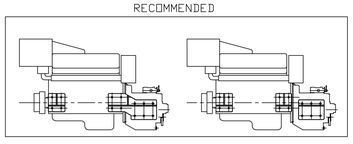
| TRANSFER GEAR | GEAR SETS | DIM. FROM PORT S'FACE - PINION O.D. |
|---|---|---|
| 32.9 [1.3] | 3.48:1 | 100.5 [4.0] |
| | 2.92:1 | 92.8 [3.7] |
| | 2.48:1 | 85.3 [3.4] |
| | 2.03:1 | 75.0 [3.0] |
| | 1.76:1 | 67.1 [2.6] |
| | 1.53:1 | 59.0 [2.3] |
| (V) | 1.33:1 | 51.6 [2.0] |
| | 1.17:1 | 43.0 [1.7] |

(N) INCH DIMENSIONS AND POUNDS SHOWN IN BRACKETS [ ]

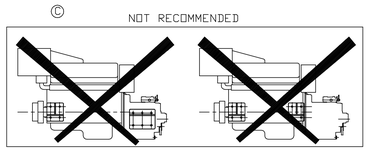
NOTE:
WHEN MOUNTING ENGINE/TRANSMISSION IN BOAT, ALL THE MOUNTING PADS ON THE ENGINE MUST BE USED-PLUS THE TRANSMISSION SIDE MOUNTING PADS. FAILURE TO DO SO MAY RESULT IN DAMAGE TO TRANSMISSION. SEE BELOW.

THE 1016249 CONFIGURATION IS NOT SUITABLE FOR REMOTE MOUNTING.

(C)
RECOMMENDED



NOT RECOMMENDED



(T) OPTIONAL TEMPERATURE INDICATING SWITCH: CUSTOMER TO INSTALL IN A (3/4 X 3/4 X 3/4) PIPE TEE IN THE HYDRAULIC LINE LEADING FROM THE MARINE TRANSMISSION PUMP TO THE HEAT EXCHANGER INLET. REFER TO HYDRAULIC DIAGRAM.

NOTE:
ALL POINTS AVAILABLE FOR TESTING ARE CODED (T)

COMPANION FLANGE MAX. BORES:
95.2 [3.75] ø WITH 22.2 [7/8"] SQUARE KEY
114.3 [4.50] ø WITH 25.4 [1.00"] SQUARE KEY
120.6 [4.75] ø WITH 31.8 [1-1/4"] SQUARE KEY
139.7 [5.50] ø WITH 31.8 [1-1/4"] X 22.2[7/8"] RECT. KEY & .125:1 (1.50IN./FT.) TAPER

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METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

MATERIAL
HEAT TREAT
SURFACE TREATMENT
WEIGHT kg
WR² N m²
FIRST USE
ASSY.
MODEL
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1° GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 9-14-95
SCALE .50=1mm
DRN. AZ
CHK. DAS
APPD. DAS

TWIN DISC INCORPORATED RACINE, WI 53403 - USA

1016249

NAME MG5203(SC) MARINE TRANSMISSION

SHEET 2 OF 4 REV Y

E D C B A
6 5 4 3 2 1

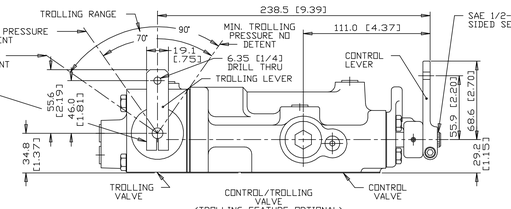
(OPTIONAL) TROLLING VALVE INSTALLATION AND OPERATING NOTES:

1) REFER TO VALVE ASSEMBLY DRAWING FOR ADDITIONAL INSTALLATION NOTES. CONTROL HEAD FOR TROLLING VALVE MUST INCLUDE A DEVICE TO LOCK TROLLING VALVE CONTROL LEVER IN THE DETENTED NO-TROLL POSITION DURING MANEUVERING, DOCKING AND OTHER OPERATING CONDITIONS THAT REQUIRE FULL POWER TO THE PROPELLER.

2) MAXIMUM ENGINE SPEED WHILE TROLLING 1100 RPM OR 60% OF FULL-LOAD ENGINE SPEED, WHICHEVER IS SMALLER.

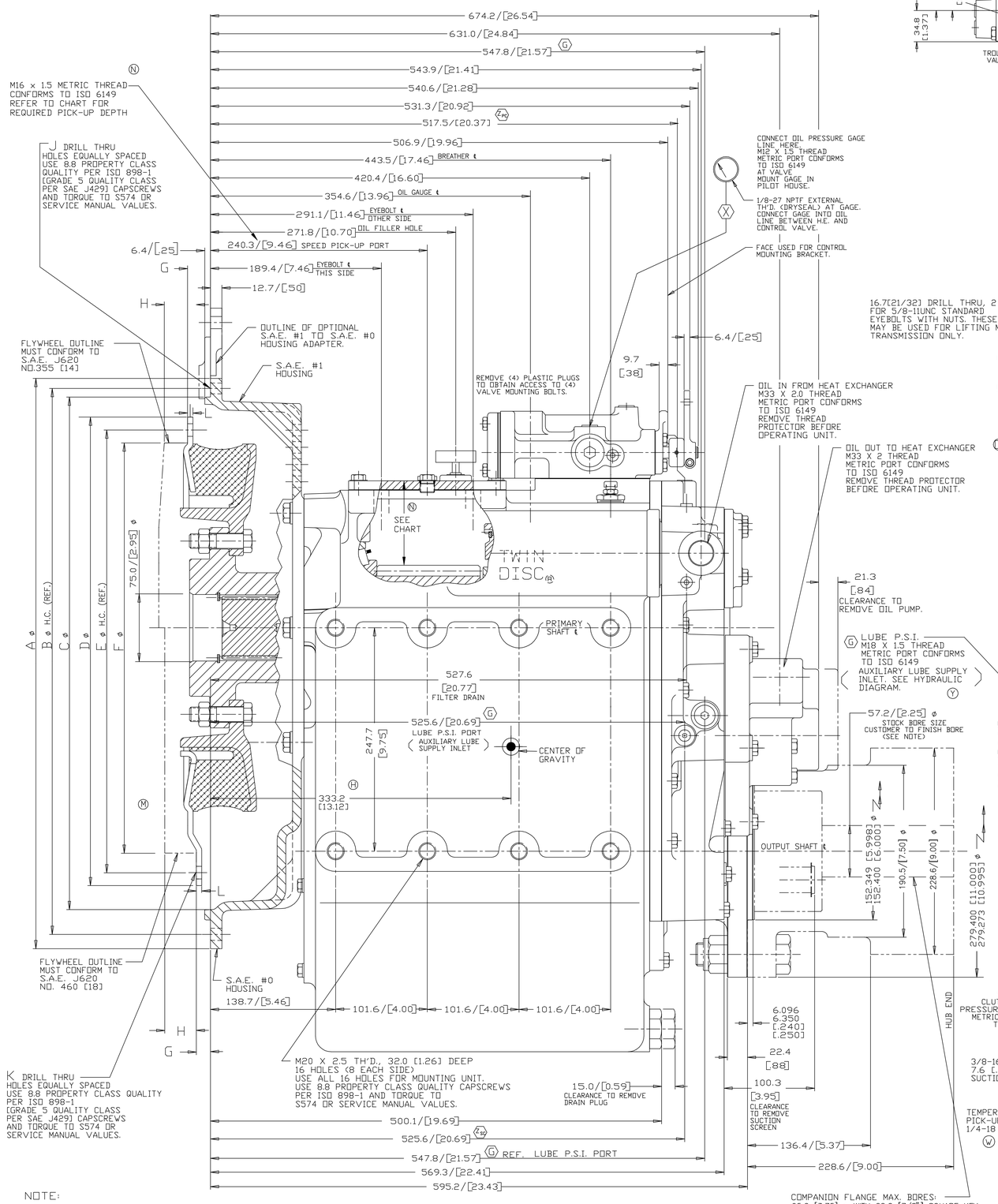
3) WITH CONTROL VALVE LEVER IN NEUTRAL, SELECT TROLLING FUUCTION BY MOVING TROLLING CONTROL LEVER OUT OF LOCKED DETENTED POSITION TO MAXIMUM TROLLING POSITION. SELECT TROLLING DIRECTION OF TRAVEL BY MOVING CONTROL VALVE LEVER TO THE PRIMARY CLUTCH OR SECONDARY CLUTCH POSITION. MOVE TROLLING CONTROL LEVER FROM MINIMUM TROLLING POSITION TO SELECT DESIRED TROLLING SPEED. WHEN TROLLING LEVER IS ADVANCED CLOSE TO DETENTED NO-TROLL POSITION, THE TROLLING CLUTCH MAY ENGAGE FULLY.

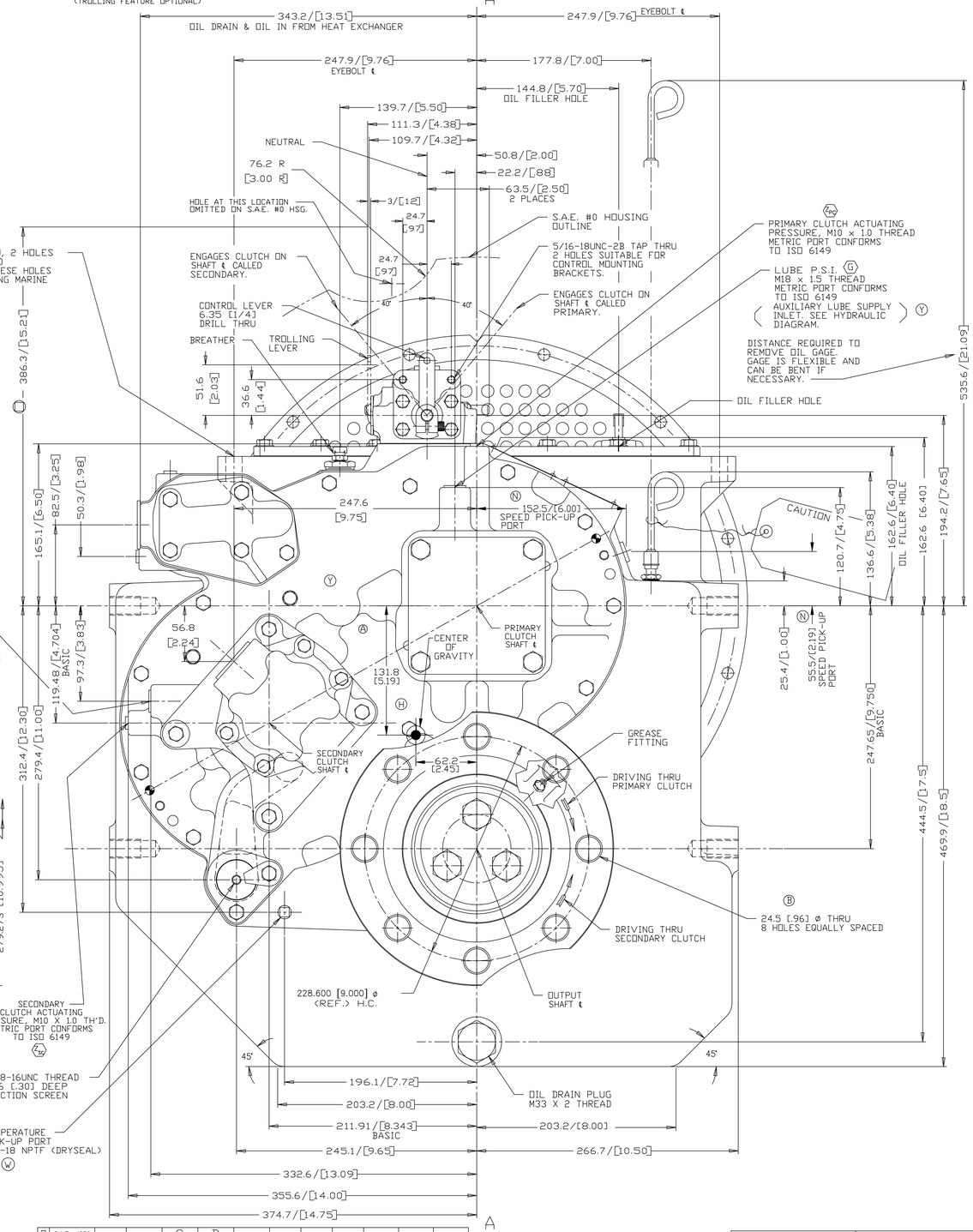
THE TROLLING LEVER ANGULAR LOCATION MAY BE ADJUSTED SO THAT THE 90° LEVER ROTATION REQUIRED FOR CONTROL FALLS ANYWHERE WITHIN THE 360° RANGE IN WHICH THE LEVER MAY BE LOCATED.




(X) CONTROL VALVE:
18-62 (4-14 lbs.) AT THE 56.0 (2.20) R LOCATION OF THE 6.35 (1/4) DIA. HOLE IS REQUIRED TO OVERCOME DETENT EFFORT. THE DETENT FEATURE IS PROVIDED IN THE FULL PRIMARY CLUTCH, FULL SECONDARY CLUTCH AND NEUTRAL LEVER POSITIONS. (THE DETENT SPRING AND PIN MAY BE OMITTED WHEN REMOTE CONTROL SYSTEMS PROVIDE THE PRIMARY, NEUTRAL AND SECONDARY DETENTS THAT CORRESPOND EXACTLY WITH VALVE DETENT POSITIONS. FORCE AT THE LEVER HOLE TO OPERATE THE VALVE THEN REDUCES TO 13-31N (3-7 LBS.) THE REMOTE CONTROL VALVE ACTUATOR MUST PROVIDE ±35.8 [1.41] LINEAR TRAVEL FROM NEUTRAL AT THE 6.35 (1/4) DIA. HOLE LOCATION. ROTATIONAL STOPS AT THE STATED VALVE TRAVEL LIMITS HAVE A MAXIMUM CAPACITY OF 445N (100 LBS.) AT THE 6.35 (1/4) DIA. HOLE LOCATION. VALVE ACTUATORS WITH FORCE CAPABILITY EXCEEDING THIS LIMIT MUST HAVE SEPARATE STOPPING DEVICES SO CAPACITY OF THE VALVE ROTATIONAL STOPS IS NOT EXCEEDED. EXCEEDING THE CAPACITY OF THE VALVE ROTATIONAL STOPS CAN CAUSE LOSS OF CONTROL.

| HEAT EXCHANGER (H.E.) REQUIREMENTS |
|---|
| REFER TO B3649K FOR HEAT EXCHANGER DATA. |


674.2/[26.54]
631.0/[24.84]
547.8/[21.57]
543.9/[21.41]
540.6/[21.28]
531.3/[20.92]
517.5/[20.37]
506.9/[19.96]
443.5/[17.46] BREATHER ℄
420.4/[16.60]
354.6/[13.96] OIL GAUGE ℄
291.1/[11.46] EYEBOLT ℄ OTHER SIDE
271.8/[10.70] OIL FILLER HOLE
240.3/[9.46] SPEED PICK-UP PORT
189.4/[7.46] EYEBOLT ℄ THIS SIDE
12.7/[.50]
M16 x 1.5 METRIC THREAD CONFORMS TO ISO 6149 REFER TO CHART FOR REQUIRED PICK-UP DEPTH
J DRILL THRU HOLES EQUALLY SPACED USE 8.8 PROPERTY CLASS QUALITY PER ISO 898-1 (GRADE 5 QUALITY CLASS PER SAE J429) CAPSCREWS AND TORQUE TO S574 OR SERVICE MANUAL VALUES.
6.4/[.25]
OUTLINE OF OPTIONAL S.A.E. #1 TO S.A.E. #0 HOUSING ADAPTER.
FLYWHEEL OUTLINE MUST CONFORM TO S.A.E. J620 NO.355 [14]
S.A.E. #1 HOUSING
REMOVE (4) PLASTIC PLUGS TO OBTAIN ACCESS TO (4) VALVE MOUNTING BOLTS.
CONNECT OIL PRESSURE GAGE LINE HERE. M12 X 1.5 THREAD METRIC PORT CONFORMS TO ISO 6149 AT VALVE MOUNT GAGE IN PILOT HOUSE.
1/8-27 NPTF EXTERNAL TH'D. (DRYSEAL) AT GAGE. CONNECT GAGE INTO OIL LINE BETWEEN H.E. AND CONTROL VALVE.
FACE USED FOR CONTROL MOUNTING BRACKET.
9.7 [.38]
6.4/[.25]
OIL IN FROM HEAT EXCHANGER M33 X 2.0 THREAD METRIC PORT CONFORMS TO ISO 6149 REMOVE THREAD PROTECTOR BEFORE OPERATING UNIT.
OIL OUT TO HEAT EXCHANGER M33 X 2 THREAD METRIC PORT CONFORMS TO ISO 6149 REMOVE THREAD PROTECTOR BEFORE OPERATING UNIT.
SEE CHART
TWIN DISC
21.3 [.84] CLEARANCE TO REMOVE OIL PUMP.
PRIMARY SHAFT ℄
LUBE P.S.I. M18 X 1.5 THREAD METRIC PORT CONFORMS TO ISO 6149 AUXILIARY LUBE SUPPLY INLET. SEE HYDRAULIC DIAGRAM.
57.2/[2.25] ø STOCK BORE SIZE CUSTOMER TO FINISH BORE (SEE NOTE)
527.6 [20.77] FILTER DRAIN
525.6/[20.69]
LUBE P.S.I. PORT (AUXILIARY LUBE SUPPLY INLET)
247.7 [9.75]
CENTER OF GRAVITY
333.2 [13.12]
OUTPUT SHAFT ℄
152.349 [5.998] ø
152.400 [6.000] ø
190.5/[7.50] ø
228.6/[9.00] ø
279.400 [11.0001] ø
279.273 [10.9951] ø
HUB END
A ø H.C. (REF.)
B ø H.C. (REF.)
C ø
D ø H.C. (REF.)
E ø
F ø
75.0/[2.95] ø
FLYWHEEL OUTLINE MUST CONFORM TO S.A.E. J620 NO. 460 [18]
S.A.E. #0 HOUSING
138.7/[5.46]
101.6/[4.00]
101.6/[4.00]
101.6/[4.00]
H
G
K DRILL THRU HOLES EQUALLY SPACED USE 8.8 PROPERTY CLASS QUALITY PER ISO 898-1 (GRADE 5 QUALITY CLASS PER SAE J429) CAPSCREWS AND TORQUE TO S574 OR SERVICE MANUAL VALUES.
M20 X 2.5 TH'D., 32.0 [1.26] DEEP 16 HOLES (8 EACH SIDE) USE ALL 16 HOLES FOR MOUNTING UNIT. USE 8.8 PROPERTY CLASS QUALITY CAPSCREWS PER ISO 898-1 AND TORQUE TO S574 OR SERVICE MANUAL VALUES.
15.0/[0.59] CLEARANCE TO REMOVE DRAIN PLUG
6.096
6.350 [.240] [.250]
22.4 [.88]
100.3 [3.95] CLEARANCE TO REMOVE SUCTION SCREEN
500.1/[19.69]
525.6/[20.69]
547.8/[21.57] REF. LUBE P.S.I. PORT
569.3/[22.41]
595.2/[23.43]
136.4/[5.37]
228.6/[9.00]




| SAE NO | S.A.E. J620 MARINE TRANSMISSION FLYWHEEL NO. | A | B | C +0.000 -0.127 (+.000-.005) | D +0.000 -0.102 (+.000-.004) | E | F | G | H | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 460 [18] | 711.2 (28.00) | 679.45 (26.750) | 647.70 (25.500) | 571.50 (22.500) | 542.92 (21.375) | 498.3 (19.62) | 15.7 (.62) | 35.0 (1.38) | 16.0R 13.5 (17/32) | 6.0R 16.7 (.66) | 6.0 (.24) |
| 1 | 355 [14] | 552.4 (21.75) | 530.20 (20.875) | 511.17 (20.125) | 466.72 (18.375) | 438.15 (17.250) | 409.4 (16.12) | 25.4 (1.00) | 25.7 (1.01) | 12.0R 11.9 (15/32) | 8.0R 19.5 (.53) | 12.0 (.25) |

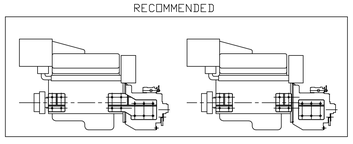
| TRANSFER GEAR | GEAR SETS | DIM. FROM PORT S'FACE - PINION O.D. |
|---|---|---|
| 32.9 [1.3] | 3.48:1 | 100.5 [4.0] |
| | 2.92:1 | 92.8 [3.7] |
| | 2.48:1 | 85.3 [3.4] |
| | 2.03:1 | 75.0 [3.0] |
| | 1.76:1 | 67.1 [2.6] |
| | 1.53:1 | 59.0 [2.3] |
| (V) | 1.33:1 | 51.6 [2.0] |
| | 1.17:1 | 43.0 [1.7] |

(N) INCH DIMENSIONS AND POUNDS SHOWN IN BRACKETS [ ]

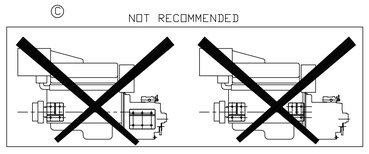
NOTE:
WHEN MOUNTING ENGINE/TRANSMISSION IN BOAT, ALL THE MOUNTING PADS ON THE ENGINE MUST BE USED-PLUS THE TRANSMISSION SIDE MOUNTING PADS. FAILURE TO DO SO MAY RESULT IN DAMAGE TO TRANSMISSION. SEE BELOW.

THE 1016249 CONFIGURATION IS NOT SUITABLE FOR REMOTE MOUNTING.

© RECOMMENDED



NOT RECOMMENDED



COMPANION FLANGE MAX. BORES:
95.2 [3.75] ø WITH 22.2 [7/8"] SQUARE KEY
114.3 [4.50] ø WITH 25.4 [1.00"] SQUARE KEY
120.6 [4.75] ø WITH 31.8 [1-1/4"] SQUARE KEY
139.7 [5.50] ø WITH 31.8 [1-1/4"] X 22.2[7/8"] RECT. KEY & .125:1 (1.50IN./FT.) TAPER

(T) OPTIONAL TEMPERATURE INDICATING SWITCH: CUSTOMER TO INSTALL IN A (3/4 X 3/4 X 3/4) PIPE TEE IN THE HYDRAULIC LINE LEADING FROM THE MARINE TRANSMISSION PUMP TO THE HEAT EXCHANGER INLET. REFER TO HYDRAULIC DIAGRAM.

NOTE:
ALL POINTS AVAILABLE FOR TESTING ARE CODED (T)

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| | |
|---|---|
| MATERIAL | |
| HEAT TREAT | |
| SURFACE TREATMENT | |
| WEIGHT kg | WR² N m² |
| FIRST USE | |
| ASSY. | |
| MODEL | |
| NAME | MG5203(SC) MARINE TRANSMISSION |

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1° GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

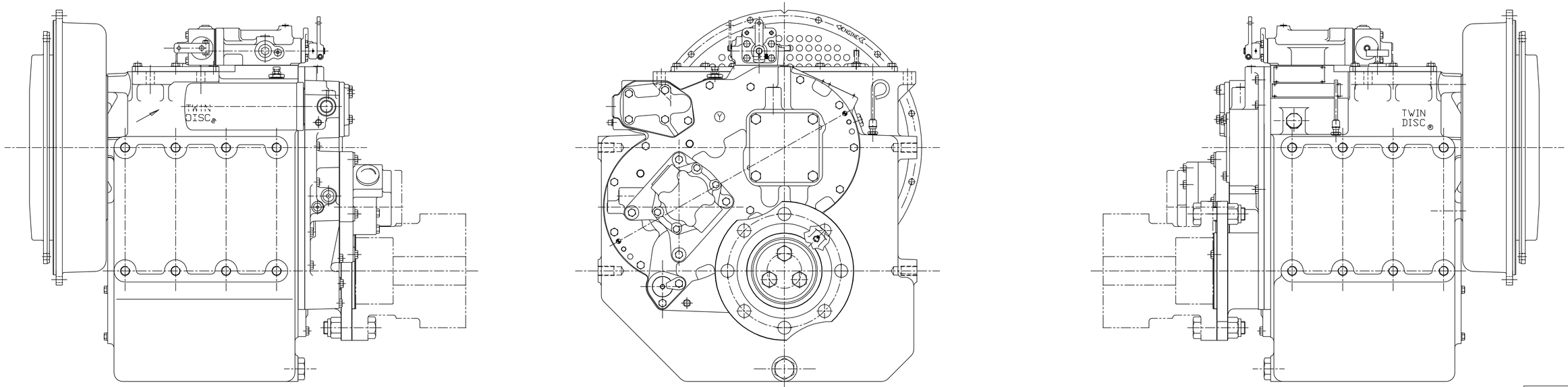
| | |
|---|---|
| DATE | 9-14-95 |
| SCALE | .50=1mm |
| DRN. | AZ |
| CHK. | DAS |
| APPD. | DAS |
| SHEET 2 OF 4 | REV Y |

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

TWIN DISC INCORPORATED
RACINE, WI 53403 - USA

1016249

E D C B A




Ⓐ WAS EX8487-32

METRIC

THIRD ANGLE PROJECTION

SIMILAR TO

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MATERIAL

WEIGHT LBS.

WR² LBS. IN²

HEAT TREAT

FIRST USE
ASSY.
MODEL

SURFACE TREATMENT

NAME MG5203 (S.C.) MARINE TRANSMISSION

UNLESS OTHERWISE SPECIFIED
MACHINED DIMENSIONS
X.X ±0.030
X.XX ±0.010
X.XXX ±0.005
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 8-28-95
SCALE .25=1.00
DRN. KDS
CHK. DAS
APPD. DAS

TWIN DISC INCORPORATED RACINE, WI 53403 - USA

1016249

SHEET 4 OF 4 Ⓟ REV Y

F E D C B A

6 5 4 3 2 1

## ASSEMBLY INSTRUCTIONS:

ASSEMBLE AND TEST PER S570AE.
NOTES #1 THRU #8 ARE IN S570AE.

## THESE STANDARDS APPLY:

S574 FASTENER TORQUE REQUIREMENTS
S692 BEARING SHIMMING
S765 TAPERED JOINT ASSEMBLY

| | |
|---|---|
| MA217H | 2 |
| B1048BB | 2 |
| M2693P | 2 |
| 1015361 | 1 |
| ✱ 1015360 | 1 |
| MA1034B STEEL BALL | 1 |
| MA585DA CONE | 2 |
| MA590AL CUP THIS BEARING USED WITH 3.48:1 RATIO ONLY | |
| MA585AN CONE | 2 |
| MA590AL CUP | |

| | |
|---|---|
| MA585HC CONE | 2 |
| MA590AR CUP | |
| 1001380 | 1 |
| B6231 | 2 |
| A2669AU | 2 |
| 1016277 | 1 |

| | |
|---|---|
| 206107B | 20 |
| 206106P | 22 |
| B3616A | 2 |
| M2693E | 2 |

| | |
|---|---|
| XA2703BD | 32 |
| A2701BG | 1 |
| A2703BD | 1 |
| B6232 | 2 |

| | |
|---|---|
| 203190B | 2 |
| M19041DA | 2 |
| MA929 | 1 |
| A2706AC | 1 |
| M19900 | 1 |
| MA960E | 2 |
| MA1039A | 2 |
| MA585HF CONE | 2 |
| MA590BK CUP | |
| 1002091 | 2 |

| | |
|---|---|
| ASSEMBLE TAPERED EDGE SIDE AWAY FROM BEARING | |
| A2915CK | 2 |
| M2020AD | 4 |
| 1014861 | 1 |
| M1904AQ | 4 |

| | |
|---|---|
| B1703D PRESSURE GAUGE | 1 |
| MA1052K | 4 |
| 1017133 | 1 |
| B1337F | 1 |

OIL PRESSURE GAGE

1018084Z
ELECTRIC CONTROL VALVE (24 VDC)

| | |
|---|---|
| 1016274 | 2 |
| 3.48:1 RATIO | 21 T |
| 1016271 | 2 |
| 2.92:1 RATIO | 24 T |
| 1016268 | 2 |
| 2.48:1 RATIO | 27 T |
| 1016324 | 2 |
| 2.03:1 RATIO | 31 T |
| 1016667 | 2 |
| 1.76:1 RATIO | 33 T |
| 1016320 | 2 |
| 1.53:1 RATIO | 36 T |
| Ⓧ 1018492 | 2 |
| 1.33:1 RATIO | 39 T |
| Ⓖ 1016318 | 2 |
| 1.17:1 RATIO | 42 T |

| | |
|---|---|
| 1014883 | AS REQ'D. |
| 1014884 | |
| 1014885 | |

SEE NOTE #6

| | |
|---|---|
| XB3614B | 1 |
| B3614B | 1 |
| MA950B LABEL | 1 |
| B3646A | 1 |

| | |
|---|---|
| M1731CP | 1 |
| B1048H | 1 |
| 1003279 | 1 |
| 1003436 | 1 |
| A2518A | 1 |
| M2027F | 2 |

SET SPRING LENGTH TO 30.2 mm

FILTER BY-PASS

MOUNT LUBE INSTRUCTION PLATE WITH WORDS "MARINE TRANSMISSION LUBRICANT" TOWARDS BREATHER.

MOUNT INSTRUCTION PLATE WITH WORDS "MARINE TRANSMISSION" TOWARDS BREATHER.

SEE NOTE "b"

| | |
|---|---|
| 1016114 | 1 |
| 1015109 | 1 |
| MA977 | 1 |
| MA1038C | 1 |
| MA1039E | 16 |
| MA961P | 16 |

| | |
|---|---|
| 1001349 | 1 |
| 1001218 | 1 |
| Ⓥ 1018461 | 1 |
| Ⓥ 1018462 | 1 |
| 1015110 | 1 |
| 1016276 | 1 |
| Ⓥ 1018470 | 1 |
| ✱ 1018463 | 1 |
| MA1064D THREAD INSERT | 2 |
| MA1038A | 2 |
| MA1038D | 2 |
| 202347 | 1 |
| A2916JZ | 1 |

| | |
|---|---|
| 1016112 | 1 |
| ✱ 1016111 | 1 |
| MA1034B STEEL BALL | 1 |

| | |
|---|---|
| 1014860 | 1 |
| 1014883 | AS REQ'D. |
| 1014884 | |
| 1014885 | |
| A2916FW | 1 |
| MA431 | 2 |
| 1016120 | 1 |
| 1016191 | 1 |

SEE NOTE #6

| | |
|---|---|
| 1003738 | 1 |
| M2280 | 1 |
| M2052CD | 1 |
| MA961V | 1 |
| 1003736 | 1 |
| MA961R | 4 |
| ▲ M2702F | 1 |
| MA1038A | 2 |

Ⓥ SEE NOTE #8

| | |
|---|---|
| MA1039E | 19 |
| Ⓥ M2081D | 2 |
| Ⓥ MA960C | 2 |
| ▲ M2702F | 1 |
| MA961T | 4 |
| MA996Q | 4 |
| MA961S | 9 |
| MA1035A | 2 |

| | |
|---|---|
| B2415 | 1 |
| M422B | 8 |
| 204098C | 1 |
| B3631G | 1 |
| MA656C | 1 |

CAUTION

| | |
|---|---|
| XB2301H | 1 |
| B2301H | 1 |
| B2300 | 1 |

| | |
|---|---|
| MA1038C | 1 |

| | |
|---|---|
| MA1038A | 1 |
| MA996N | 4 |
| MA1038A | 2 |

| | |
|---|---|
| Ⓨ MA961U | 2 |
| Ⓨ M2051FL | 1 |
| MA1055A | 3 |
| B1504GE | 1 |

| | |
|---|---|
| 1016252 | 1 |
| 1016217 | 1 |
| MA996P | 12 |
| MA1039D | 12 |
| M1945BX | 1 |
| M2426 | 1 |
| Ⓣ B1048C | 1 |
| Ⓙ 1017871 | 1 |
| Ⓟ MA947D | 16 |
| MA1041E | 16 |
| 1016215 | 1 |

S.A.E. #1 HOUSING

SEE NOTES #1 & #5

SEE NOTE #2

SEE NOTE #3

SEE NOTE #4

SEE NOTE #9

| | |
|---|---|
| M1945T | 1 |
| 1016251 | 1 |

S.A.E. #0 HOUSING

| | |
|---|---|
| 1016107 | 1 |
| 1001421 | 1 |

ASSEMBLY 1016250

| | |
|---|---|
| 1016256 | |
| ✱ 1016255 | 1 |
| ✱ MA1064A HELI-COIL | 16 |

ASSEMBLY 1016250A

| | |
|---|---|
| 1016256A | |
| ✱ 1016255A | 1 |
| ✱ MA1064A HELI-COIL | 14 |

| | | | |
|---|---|---|---|
| MA960J | 4 | 4 | 4 |
| M2081D | 4 | 4 | 4 |
| 1015347 | 1 | 1 | 1 |
| 1015346 | 1 | 1 | 1 |
| MA1054A | | | 4 |
| | ✱ | ✱ | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MA585HD CONE | 1 | | | | | | | | |
| MA590EZ CUP | | 1 | | | | | | | |
| 1016275 | | | 73 T | | | | | | |
| 3.48:1 RATIO | | 1 | | | | | | | |
| 1016272 | | | | 70 T | | | | | |
| 2.92:1 RATIO | | 1 | | | | | | | |
| 1016269 | | | | | 67 T | | | | |
| 2.48:1 RATIO | | 1 | | | | | | | |
| 1016113 | | | | | | 63 T | | | |
| 2.03:1 RATIO | | 1 | | | | | | | |
| 1016602 | | | | | | | 58 T | | |
| 1.76:1 RATIO | | 1 | | | | | | | |
| 1016119 | | | | | | | | 55 T | |
| 1.53:1 RATIO | | 1 | | | | | | | |
| 1018493 | | | | | | | | | 52 T |
| 1.33:1 RATIO | | 1 | | | | | | | |
| 1016104 | | | | | | | | | 1 |
| 1.17:1 RATIO | | 1 | | | | | | | 49 T |
| | Ⓒ | | | | | | | Ⓧ | |

| | | | |
|---|---|---|---|
| MA585HE CONE | 1 | | |
| MA590FA CUP | | 1 | |
| 1014880 | | | AS REQ'D. |
| 1014881 | | | |
| 1014882 | | | |
| MA1040B | | | 1 |

SEE NOTE #6

| | | |
|---|---|---|
| 1016109 | 1 | |
| MA961Q | 6 | |
| M268 | 1 | |

OPTIONAL EXTRA-SUPPLIED ONLY WHEN SO SPECIFIED

| | |
|---|---|
| 1015378 | 1 |
| 1015119 | 1 |
| MA1046A | 8 |
| MA1048A | 8 |

| | |
|---|---|
| A2916JT | 1 |
| B2502 | 1 |
| 212754 | 1 |
| B2130B | 1 |

SUCTION SCREEN

### CUSTOMER NOTES:

a.) OIL CAPACITY 26.5 L (7 GALS.), LESS HOSES AND HEAT EXCHANGER.

b.) THIS UNIT CAN NOT BE USED WITH LEFT HAND ENGINE.

c.) OPTIONAL EQUIPMENT:
COMPANION FLANGE ASSEMBLY: 1015378 Ⓒ
LIVE P.T.O.: XB6243A (AUXILIARY PUMP DRIVE)
HYDRAULIC CLUTCHED P.T.O.: XA7554 (SHAFT DRIVE), AND XA7554A (PUMP DRIVE)
TRAILING PUMP, 1016473
FLEXIBLE COUPLING INPUTS-SEE SHEET 3.
K BOM NO. 1096 (METRIC TO NPTF ADAPTER KIT)
MANUAL TROLLING VALVE KIT: 1017555
ELECTRIC TROLLING VALVE KIT: 1017554 (AD)
ELECTRIC CONTROL VALVE (12 VDC): 1018084AG
Ⓤ OIL TEMPERATURE INDICATING SWITCH: B3424, FOR INSTALLATION LOCATION, SEE HYDRAULIC DIAGRAM AND SHEET 2.

✱ NOT SERVICEABLE SEPARATELY.
▲ REMOVE BEFORE OPERATING, 2 PLACES, THREAD PROTECTORS.

MAX. INPUT SPEED: 2300 R.P.M.
CONSULT SALES DEPT. APPLICATION ENGINEERS FOR OTHER LIMITING CONDITIONS.

| | |
|---|---|
| SHEET 1 OF 5 | CROSS SECTIONS AND PART NUMBERS |
| SHEET 2 OF 5 | ASSEMBLY 1016250 INSTALLATION DRAWING |
| SHEET 3 OF 5 | ASSEMBLY 1016250A INSTALLATION DRAWING |
| SHEET 4 OF 5 | FLEXIBLE COUPLING INPUTS |
| SHEET 5 OF 5 | 4 - VIEW |
| B3504AE | MASS ELASTIC SYSTEM |
| B3649K | HEAT EXCHANGER REQUIREMENTS |
| A7119Q | HYDRAULIC DIAGRAM |

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ALL | Z | --- | 28985 | 12-14-98 |
| | | | | | | 1,2 | Y | C2,C1 | 28834 | 10-6-98 |
| 1,2,3 | AD | F-5,4 E-1 | 29694 | 11-22-99 | | 1,2 | X | B1,B1 C2 | 28722 | 8-11-98 |
| 4 | AC | D-5 | 29627 | 10-12-99 | | 1 | W | B2-4 C3 | 28681 | 7-23-98 |
| 1,2,3,5 | AB | | 29222 | 3-29-99 | | 1 | V | B2-4 C3 | 28657 | 7-21-98 |
| 1,2 | AA | | 28958 | 1-21-99 | | 1 | U | E1 | 28544 | 5-4-98 |
| SHT.NO. | REV | ZONE | CH. NO. | DATE | | SHT.NO. | REV | ZONE | CH. NO. | DATE |

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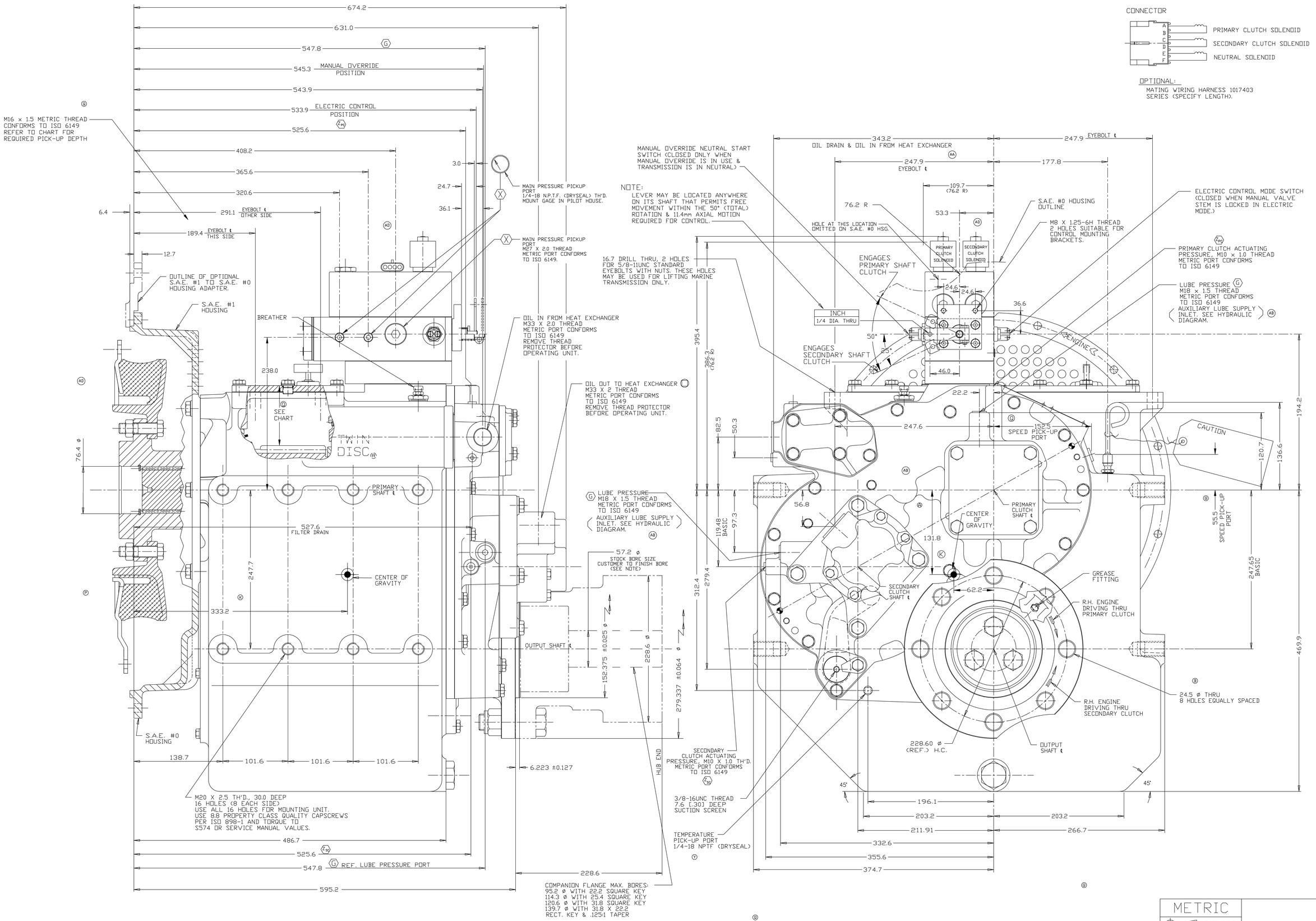
MATERIAL
GEAR RATIOS: Ⓧ 1.17:1 1.76:1 2.92:1 1.33:1 2.03:1 3.48:1 1.53:1 2.48:1
HEAT TREAT
SURFACE TREATMENT
WEIGHT kg | VR² N.A.
FIRST USE
ASSY.
MODEL
NAME MG-5204SC MARINE TRANSMISSION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE mm
MACHINED DIMENSIONS
X ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 8-1-95
SCALE .5=1mm
DRN. AZ
CHK. DAS
APPD. DAS

TWIN DISC INCORPORATED RACINE, WI 53403 - USA
1016250
1016250A
SHEET 1 OF 5 REV AD


674.2
631.0
547.8
545.3 MANUAL OVERRIDE POSITION
543.9
533.9 ELECTRIC CONTROL POSITION
525.6
408.2
365.6
320.6
291.1 EYEBOLT ℄ OTHER SIDE
189.4 EYEBOLT ℄ THIS SIDE
6.4
12.7
M16 x 1.5 METRIC THREAD CONFORMS TO ISO 6149 REFER TO CHART FOR REQUIRED PICK-UP DEPTH
3.0
24.7
36.1
MAIN PRESSURE PICKUP PORT 1/4-18 N.P.T.F. (DRYSEAL) TH'D. MOUNT GAGE IN PILOT HOUSE.
MAIN PRESSURE PICKUP PORT M27 X 2.0 THREAD METRIC PORT CONFORMS TO ISO 6149.
OUTLINE OF OPTIONAL S.A.E. #1 TO S.A.E. #0 HOUSING ADAPTER.
S.A.E. #1 HOUSING
BREATHER
238.0
SEE CHART
OIL IN FROM HEAT EXCHANGER M33 X 2.0 THREAD METRIC PORT CONFORMS TO ISO 6149 REMOVE THREAD PROTECTOR BEFORE OPERATING UNIT.
OIL OUT TO HEAT EXCHANGER M33 X 2 THREAD METRIC PORT CONFORMS TO ISO 6149 REMOVE THREAD PROTECTOR BEFORE OPERATING UNIT.
TWIN DISC
76.4 ø
PRIMARY SHAFT ℄
527.6 FILTER DRAIN
247.7
CENTER OF GRAVITY
333.2
OUTPUT SHAFT ℄
LUBE PRESSURE M18 X 1.5 THREAD METRIC PORT CONFORMS TO ISO 6149
AUXILIARY LUBE SUPPLY INLET. SEE HYDRAULIC DIAGRAM.
57.2 ø STOCK BORE SIZE CUSTOMER TO FINISH BORE (SEE NOTE)
152.375 ±0.025 ø
228.6 ø
279.337 ±0.064 ø
HUB END
6.223 ±0.127
S.A.E. #0 HOUSING
138.7
101.6
101.6
101.6
M20 X 2.5 TH'D., 30.0 DEEP 16 HOLES (8 EACH SIDE) USE ALL 16 HOLES FOR MOUNTING UNIT. USE 8.8 PROPERTY CLASS QUALITY CAPSCREWS PER ISO 898-1 AND TORQUE TO S574 OR SERVICE MANUAL VALUES.
486.7
525.6
547.8 REF. LUBE PRESSURE PORT
595.2
228.6
COMPANION FLANGE MAX. BORES:
95.2 ø WITH 22.2 SQUARE KEY
114.3 ø WITH 25.4 SQUARE KEY
120.6 ø WITH 31.8 SQUARE KEY
139.7 ø WITH 31.8 X 22.2 RECT. KEY & .125:1 TAPER
SECONDARY CLUTCH ACTUATING PRESSURE, M10 X 1.0 TH'D. METRIC PORT CONFORMS TO ISO 6149
3/8-16UNC THREAD 7.6 (.30) DEEP SUCTION SCREEN
TEMPERATURE PICK-UP PORT 1/4-18 NPTF (DRYSEAL)
MANUAL OVERRIDE NEUTRAL START SWITCH (CLOSED ONLY WHEN MANUAL OVERRIDE IS IN USE & TRANSMISSION IS IN NEUTRAL)
NOTE:
LEVER MAY BE LOCATED ANYWHERE ON ITS SHAFT THAT PERMITS FREE MOVEMENT WITHIN THE 50° (TOTAL) ROTATION & 11.4mm AXIAL MOTION REQUIRED FOR CONTROL.
16.7 DRILL THRU, 2 HOLES FOR 5/8-11UNC STANDARD EYEBOLTS WITH NUTS. THESE HOLES MAY BE USED FOR LIFTING MARINE TRANSMISSION ONLY.
343.2
OIL DRAIN & OIL IN FROM HEAT EXCHANGER
247.9 EYEBOLT ℄
247.9 EYEBOLT ℄
177.8
109.7 (76.2 R)
76.2 R
53.3
HOLE AT THIS LOCATION OMITTED ON S.A.E. #0 HSG.
S.A.E. #0 HOUSING OUTLINE
M8 X 1.25-6H THREAD 2 HOLES SUITABLE FOR CONTROL MOUNTING BRACKETS.
ELECTRIC CONTROL MODE SWITCH (CLOSED WHEN MANUAL VALVE STEM IS LOCKED IN ELECTRIC MODE.)
PRIMARY CLUTCH SOLENOID
SECONDARY CLUTCH SOLENOID
PRIMARY CLUTCH ACTUATING PRESSURE, M10 x 1.0 THREAD METRIC PORT CONFORMS TO ISO 6149
LUBE PRESSURE M18 x 1.5 THREAD METRIC PORT CONFORMS TO ISO 6149 AUXILIARY LUBE SUPPLY INLET. SEE HYDRAULIC DIAGRAM.
ENGAGES PRIMARY SHAFT CLUTCH
24.6
24.6
36.6
INCH 1/4 DIA. THRU
50°
25°
ENGINE
ENGAGES SECONDARY SHAFT CLUTCH
46.0
22.2
395.4
386.3 (76.2 R)
82.5
50.3
247.6
152.5 SPEED PICK-UP PORT
CAUTION
194.2
136.6
120.7
56.8
119.48 BASIC
97.3
CENTER OF GRAVITY
PRIMARY CLUTCH SHAFT ℄
131.8
55.5 SPEED PICK-UP PORT
247.65 BASIC
312.4
279.4
SECONDARY CLUTCH SHAFT ℄
62.2
GREASE FITTING
R.H. ENGINE DRIVING THRU PRIMARY CLUTCH
R.H. ENGINE DRIVING THRU SECONDARY CLUTCH
24.5 ø THRU 8 HOLES EQUALLY SPACED
228.60 ø (REF.) H.C.
OUTPUT SHAFT ℄
469.9
45°
45°
196.1
203.2
203.2
211.91
266.7
332.6
355.6
374.7

## SELECTOR VALVE WIRING DIAGRAM:

CONNECTOR




OPTIONAL:
MATING WIRING HARNESS 1017403 SERIES (SPECIFY LENGTH).

OPTIONAL TEMPERATURE INDICATING SWITCH:
CUSTOMER TO INSTALL IN A (3/4 X 3/4 X 3/4) PIPE TEE IN THE HYDRAULIC LINE LEADING FROM THE MARINE TRANSMISSION PUMP TO THE HEAT EXCHANGER INLET. REFER TO HYDRAULIC DIAGRAM.

NOTE:
ALL POINTS AVAILABLE FOR TESTING ARE CODED

| TRANSFER GEAR | GEAR SETS | DIM. FROM PORT S'FACE – PINION O.D. |
|---|---|---|
| 32.9 | 3.48:1 | 100.5 |
| | 2.92:1 | 92.8 |
| | 2.48:1 | 85.3 |
| | 2.03:1 | 75.0 |
| | 1.76:1 | 67.1 |
| | 1.53:1 | 59.0 |
| (X) | 1.33:1 | 51.6 |
| | 1.17:1 | 43.0 |

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

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| | |
|---|---|
| MATERIAL | |
| WEIGHT | kg / lb |
| HEAT TREAT | FIRST USE |
| | ASSY. |
| | MODEL |
| SURFACE TREATMENT | NAME: MG-5204SC MARINE TRANSMISSION |

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

| | |
|---|---|
| DATE | 8-1-95 |
| SCALE | .50=1mm |
| DRN. | AZ |
| CHK. | DAS |
| APPD. | DAS |
| SHEET 2 OF 5 | REV AD |

TWIN DISC INCORPORATED
RACINE, WI 53403 – USA

1016250
1016250A

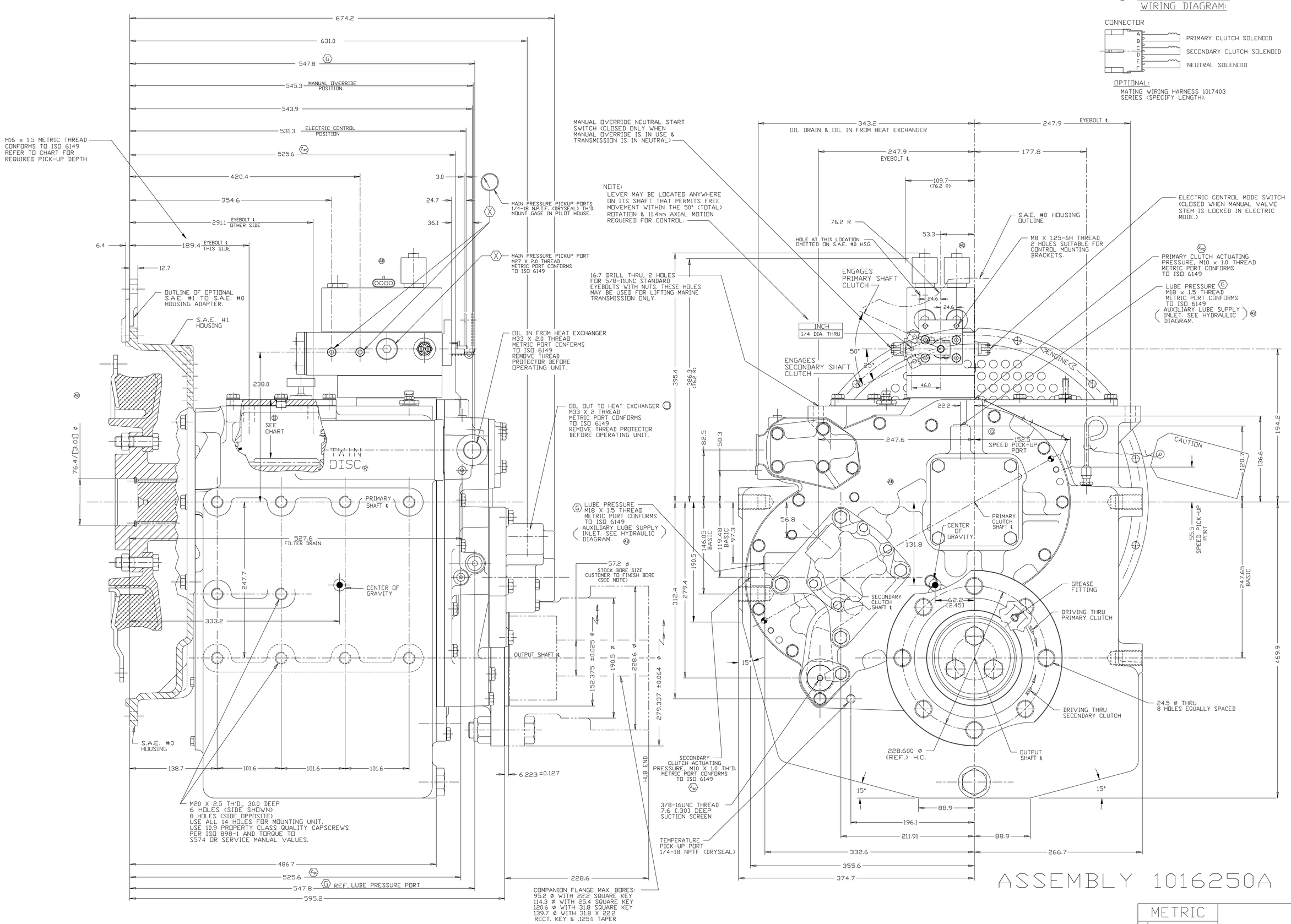
E D C B A
6 5 4 3 2 1

## (AB) SELECTOR VALVE WIRING DIAGRAM:

CONNECTOR




OPTIONAL:
MATING WIRING HARNESS 1017403 SERIES (SPECIFY LENGTH).


674.2
631.0
547.8 (G)
545.3 MANUAL OVERRIDE POSITION
543.9
531.3 ELECTRIC CONTROL POSITION
525.6 (ZM)
420.4
354.6
291.1 EYEBOLT ℄ OTHER SIDE
189.4 EYEBOLT ℄ THIS SIDE
6.4
12.7
M16 x 1.5 METRIC THREAD CONFORMS TO ISO 6149 REFER TO CHART FOR REQUIRED PICK-UP DEPTH
OUTLINE OF OPTIONAL S.A.E. #1 TO S.A.E. #0 HOUSING ADAPTER.
S.A.E. #1 HOUSING
238.0
(Q) SEE CHART
76.4 [3.01] ø
TWIN DISC (AB)
PRIMARY SHAFT ℄
527.6 FILTER DRAIN
247.7
CENTER OF GRAVITY
333.2
OUTPUT SHAFT ℄
S.A.E. #0 HOUSING
138.7
101.6
101.6
101.6
3.0
24.7
36.1
MAIN PRESSURE PICKUP PORTS 1/4-18 N.P.T.F. (DRYSEAL) TH'D. MOUNT GAGE IN PILOT HOUSE.
(X)
MAIN PRESSURE PICKUP PORT M27 X 2.0 THREAD METRIC PORT CONFORMS TO ISO 6149
OIL IN FROM HEAT EXCHANGER M33 X 2.0 THREAD METRIC PORT CONFORMS TO ISO 6149 REMOVE THREAD PROTECTOR BEFORE OPERATING UNIT.
OIL OUT TO HEAT EXCHANGER M33 X 2 THREAD METRIC PORT CONFORMS TO ISO 6149 REMOVE THREAD PROTECTOR BEFORE OPERATING UNIT.
(G) LUBE PRESSURE M18 X 1.5 THREAD METRIC PORT CONFORMS TO ISO 6149 AUXILIARY LUBE SUPPLY INLET. SEE HYDRAULIC DIAGRAM. (AB)
57.2 ø STOCK BORE SIZE CUSTOMER TO FINISH BORE (SEE NOTE)
152.375 ±0.025 ø
190.5 ø
228.6 ø
279.337 ±0.064 ø
HUB END
6.223 ±0.127
M20 X 2.5 TH'D., 30.0 DEEP
6 HOLES (SIDE SHOWN)
8 HOLES (SIDE OPPOSITE)
USE ALL 14 HOLES FOR MOUNTING UNIT.
USE 10.9 PROPERTY CLASS QUALITY CAPSCREWS PER ISO 898-1 AND TORQUE TO S574 OR SERVICE MANUAL VALUES.
486.7
525.6 (ZM)
547.8 (G) REF. LUBE PRESSURE PORT
595.2
228.6
COMPANION FLANGE MAX. BORES:
95.2 ø WITH 22.2 SQUARE KEY
114.3 ø WITH 25.4 SQUARE KEY
120.6 ø WITH 31.8 SQUARE KEY
139.7 ø WITH 31.8 X 22.2 RECT. KEY & .125:1 TAPER
MANUAL OVERRIDE NEUTRAL START SWITCH (CLOSED ONLY WHEN MANUAL OVERRIDE IS IN USE & TRANSMISSION IS IN NEUTRAL)
NOTE:
LEVER MAY BE LOCATED ANYWHERE ON ITS SHAFT THAT PERMITS FREE MOVEMENT WITHIN THE 50° (TOTAL) ROTATION & 11.4mm AXIAL MOTION REQUIRED FOR CONTROL.
16.7 DRILL THRU, 2 HOLES FOR 5/8-11UNC STANDARD EYEBOLTS WITH NUTS. THESE HOLES MAY BE USED FOR LIFTING MARINE TRANSMISSION ONLY.
SECONDARY CLUTCH ACTUATING PRESSURE, M10 X 1.0 TH'D. METRIC PORT CONFORMS TO ISO 6149 (ZM)
3/8-16UNC THREAD 7.6 [.30] DEEP SUCTION SCREEN
TEMPERATURE PICK-UP PORT 1/4-18 NPTF (DRYSEAL)
343.2
OIL DRAIN & OIL IN FROM HEAT EXCHANGER
247.9
EYEBOLT ℄
247.9
EYEBOLT ℄
177.8
109.7 (76.2 R)
76.2 R
53.3
HOLE AT THIS LOCATION OMITTED ON S.A.E. #0 HSG.
S.A.E. #0 HOUSING OUTLINE
M8 X 1.25-6H THREAD 2 HOLES SUITABLE FOR CONTROL MOUNTING BRACKETS.
ELECTRIC CONTROL MODE SWITCH (CLOSED WHEN MANUAL VALVE STEM IS LOCKED IN ELECTRIC MODE.)
(ZM) PRIMARY CLUTCH ACTUATING PRESSURE, M10 x 1.0 THREAD METRIC PORT CONFORMS TO ISO 6149
(G) LUBE PRESSURE M18 x 1.5 THREAD METRIC PORT CONFORMS TO ISO 6149 AUXILIARY LUBE SUPPLY INLET. SEE HYDRAULIC DIAGRAM. (AB)
ENGAGES PRIMARY SHAFT CLUTCH
24.6
24.6
INCH 1/4 DIA. THRU
50°
25°
ENGAGES SECONDARY SHAFT CLUTCH
ENGINE
46.0
22.2
395.4
386.3 (782 R)
82.5
50.3
247.6
(Q) 132.5 SPEED PICK-UP PORT
CAUTION
194.2
120.7
136.6
56.8
146.05 BASIC
119.48 BASIC
97.3
190.5
312.4
279.4
CENTER OF GRAVITY
131.8
PRIMARY CLUTCH SHAFT ℄
55.5 SPEED PICK-UP PORT
247.65 BASIC
469.9
SECONDARY CLUTCH SHAFT ℄
62.2 [2.45]
GREASE FITTING
DRIVING THRU PRIMARY CLUTCH
15°
DRIVING THRU SECONDARY CLUTCH
24.5 ø THRU 8 HOLES EQUALLY SPACED
228.600 ø (REF.) H.C.
OUTPUT SHAFT ℄
15°
15°
88.9
196.1
211.91
88.9
332.6
266.7
355.6
374.7

# ASSEMBLY 10016250A

(O) OPTIONAL TEMPERATURE INDICATING SWITCH: CUSTOMER TO INSTALL IN A [3/4 X 3/4 X 3/4] PIPE TEE IN THE HYDRAULIC LINE LEADING FROM THE MARINE TRANSMISSION PUMP TO THE HEAT EXCHANGER INLET. REFER TO HYDRAULIC DIAGRAM.

NOTE:
ALL POINTS AVAILABLE FOR TESTING ARE CODED (ZM)

| TRANSFER GEAR | GEAR SETS | DIM. FROM PORT S'FACE - PINION O.D. |
|---|---|---|
| 32.9 | 3.48:1 | 100.5 |
| | 2.92:1 | 92.8 |
| | 2.48:1 | 85.3 |
| | 2.03:1 | 75.0 |
| | 1.76:1 | 67.1 |
| | 1.53:1 | 59.0 |
| | 1.33:1 | 51.6 |
| | 1.17:1 | 43.0 |

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

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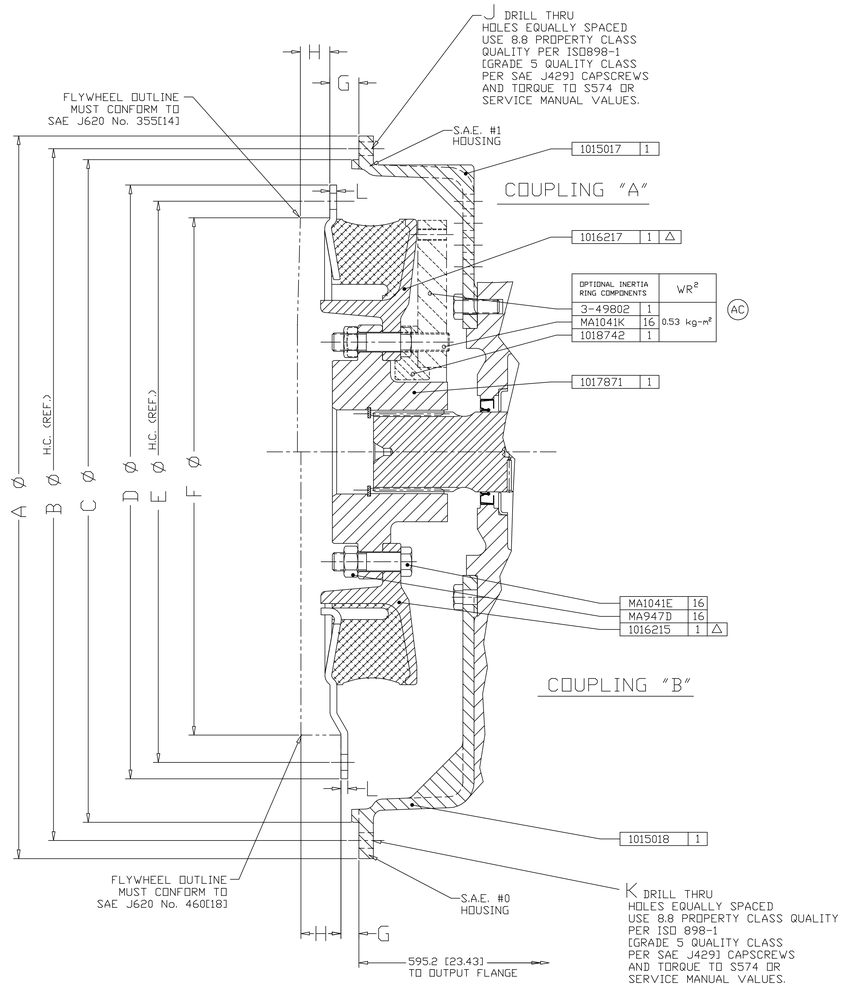
MATERIAL
WEIGHT kg / lb
HEAT TREAT
FIRST USE
ASSY.
MODEL
SURFACE TREATMENT
NAME MG-5204SC MARINE TRANSMISSION

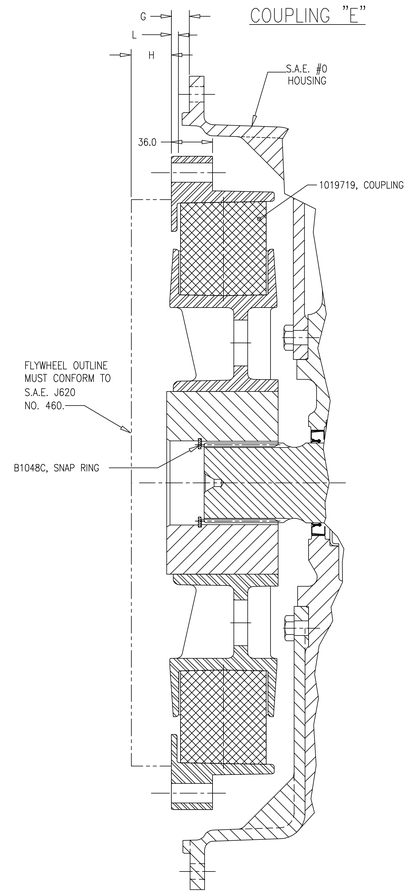
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1° GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

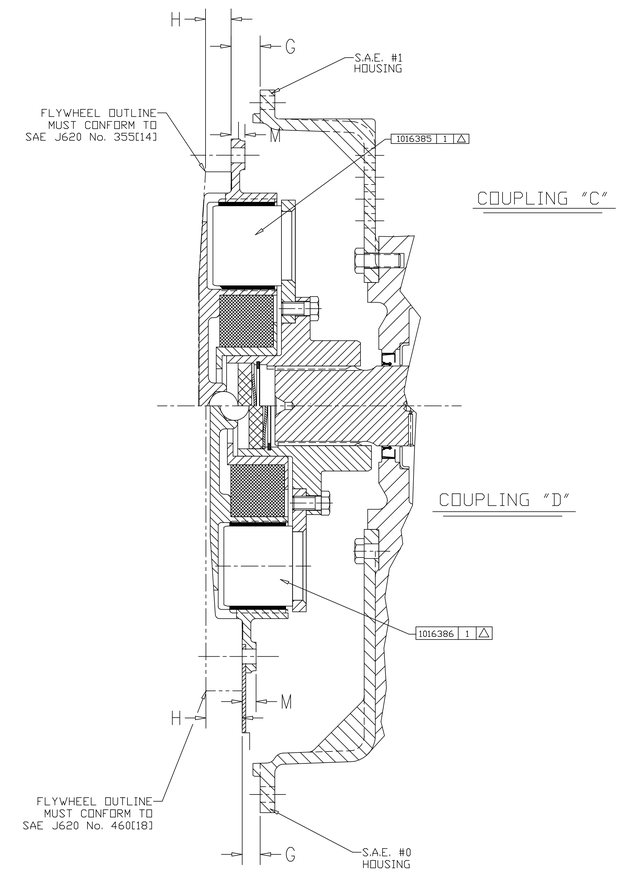
DATE 8-1-95
SCALE .50=1mm
DRN. AZ
CHK. DAS
APP'D. DAS
SHEET 3 OF 5 REV AD

TWIN DISC INCORPORATED RACINE, WI 53403 - USA
1016250
1016250A
(Z)

E D C B A
6 5 4 3 2 1


J DRILL THRU HOLES EQUALLY SPACED USE 8.8 PROPERTY CLASS QUALITY PER ISO898-1 [GRADE 5 QUALITY CLASS PER SAE J429] CAPSCREWS AND TORQUE TO S574 OR SERVICE MANUAL VALUES.
FLYWHEEL OUTLINE MUST CONFORM TO SAE J620 No. 355[14]
S.A.E. #1 HOUSING
1015017 1
COUPLING "A"
1016217 1 △
OPTIONAL INERTIA RING COMPONENTS
WR²
3-49802 1
MA1041K 16 0.53 kg-m²
1018742 1
AC
1017871 1
H.C. (REF.)
H.C. (REF.)
A Ø
B Ø
C Ø
D Ø
E Ø
F Ø
MA1041E 16
MA947D 16
1016215 1 △
COUPLING "B"
1015018 1
FLYWHEEL OUTLINE MUST CONFORM TO SAE J620 No. 460[18]
S.A.E. #0 HOUSING
K DRILL THRU HOLES EQUALLY SPACED USE 8.8 PROPERTY CLASS QUALITY PER ISO 898-1 [GRADE 5 QUALITY CLASS PER SAE J429] CAPSCREWS AND TORQUE TO S574 OR SERVICE MANUAL VALUES.
595.2 [23.43] TO OUTPUT FLANGE
H
G
L




## COUPLINGS A & B ARE OPTIONAL FOR THIS UNIT.

| COUPLING | SAE J620 FLYWHEEL SIZE | COUPLING NO. | MAX. COUPLING rpm* | NOMINAL TORQUE kN-m [lbf-in] | DYNAMIC TORSIONAL STIFFNESS | COUPLING WR² kg·m² [lb-in²] ** OUTER PARTS | COUPLING WR² kg·m² [lb-in²] ** INNER PARTS | COUPLING WEIGHT kg [lb] WITHOUT HUB | COUPLING WEIGHT kg [lb] WITH HUB |
|---|---|---|---|---|---|---|---|---|---|
| A | NO. 355 [14] | VKE 4911S -4000/14 | 2750 | 5.00 [44250] | PER CHART | 0.24 [820] | 0.40 [1383] | 23.7 [52.2] | 36.7 [76.6] |
| B | NO. 460 [18] | VKE 4911S -4000/18 | 2750 | 5.00 [44250] | PER CHART | 0.61 [2084] | 0.40 [1383] | 27.7 [61.1] | 40.7 [85.4] |

| TORQUE kN-m [lbf-in] | DYNAMIC TORSIONAL STIFFNESS kN-m/rad [lbf-in/rad] |
|---|---|
| 0.50 [4400] | 19.4 [172000] |
| 1.25 [11100] | 19.9 [176000] |
| 2.50 [22100] | 23.1 [204000] |
| 3.75 [33200] | 33.9 [300000] |
| 5.00 [44200] | 47.0 [416000] |

Ⓛ

| TORQUE kN-m | DYNAMIC TORSIONAL STIFFNESS kN-m/rad |
|---|---|
| 0.40 | 8.0 |
| 0.80 | 17.5 |
| 2.00 | 50.0 |
| 4.00 | 125.0 |
| 6.00 | 200.0 |
| 8.00 | 280.0 |

| COUPLING | SAE J620 FLYWHEEL SIZE | COUPLING NO. | MAX. COUPLING rpm* | NOMINAL TORQUE kN-m | DYNAMIC TORSIONAL STIFFNESS | COUPLING WR² kg-m² ** OUTER PARTS | COUPLING WR² kg-m² ** INNER PARTS |
|---|---|---|---|---|---|---|---|
| E | NO. 460 | T.B.A. | 2800 | 8.00 | PER CHART | 0.471 | 0.415 |

OBSOLETE

| TORQUE kN-m [lbf-in] | DYNAMIC TORSIONAL STIFFNESS kN-m/rad [lbf-in/rad] | STAGE | [X]xTkn [X] = |
|---|---|---|---|
| 0.25 [2210] | 2.5 [22000] | 1 | 0.05 |
| 0.50 [4425] | 3.2 [28000] | 1 | 0.10 |
| 1.25 [11050] | 68.0 [602000] | 1 & 2 | 0.25 |
| 2.50 [22100] | 118.0 [1044000] | 1 & 2 | 0.50 |
| 3.30 [29200] | 163.0 [1442500] | 1 & 2 | 0.66 |
| 3.75 [33200] | 198.0 [1752000] | 1 & 2 | 0.75 |
| 4.10 [36300] | 234.0 [2071000] | 1 & 2 | 0.82 |
| 5.00 [44250] | 348.0 [3080000] | 1 & 2 | 1.00 |

Ⓜ Ⓛ

| COUPLING | SAE J620 FLYWHEEL SIZE | COUPLING NO. | MAX. COUPLING rpm* | RATED TORQUE kN-m [lbf-in] PEAKSURE $T_{KN}$ | RATED TORQUE kN-m [lbf-in] INTERMEDIATE $T_K$ | RATED TORQUE kN-m [lbf-in] CONTINUOUS $T_K$ | DYNAMIC TORSIONAL STIFFNESS | WR² kg·m² [lb-in²] ** PRIMARY | WR² kg·m² [lb-in²] ** SECONDARY | COUPLING WEIGHT kg [lb] |
|---|---|---|---|---|---|---|---|---|---|---|
| C | NO. 355 | CF-DS-59-7-3-014-0933S | 2800 | 5.00 [44250] | 4.10 [36300] | 3.30 [29200] | PER CHART | 0.61 [208] | 0.16 [547] | 24.4 [53.8] |
| D | NO. 460 | CF-DS-59-7-3-018-0936S | 2700 | 5.00 [44250] | 4.10 [36300] | 3.30 [29200] | PER CHART | 0.61 [208] | 0.24 [820] | 27.5 [60.6] |

| SAE NO | S.A.E. J620 MARINE TRANSMISSION FLYWHEEL NO. | A | B | C +0,000 -0,127 | D +0,000 -0,102 | E | F | G | H | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 355 [14] | 552.4 [21.75] | 530.20 [20.875] | 511.17 [20.125] | 466.725 [18.375] | 438.15 [17.250] | 409.4 [16.12] | 25.4 [1.00] | 25.7 [1.01] | 12 OF 11.9 [15/32] | 8 OF 13.5 [.53] | 6.3 [.25] | 304.8 [12.0] |
| 0 | 460 [18] | 711.2 [28.00] | 679.45 [26.750] | 647.70 [25.500] | 571.50 [22.500] | 542.92 [21.375] | 498.3 [19.62] | 15.7 [0.62] | 35.0 [1.38] | 16 OF 13.5 [17/32] | 6 OF 16.7 [.66] | 6.0 [.24] | 304.8 [12.0] |

FOR TRANSMISSION/COUPLING ASSEMBLY TO ENGINE:
INSTALL COUPLING AND HUB TO ENGINE FLYWHEEL.
ADVANCE MARINE TRANSMISSION INTO POSITION WITH ENGINE FLYWHEEL HOUSING MOUNTING FLANGE. LINE UP INPUT SHAFT EXTERNAL SPLINE WITH INTERNAL SPLINE IN COUPLING HUB AND MOVE ENGINE AND MARINE TRANSMISSION TOGETHER MAINTAINING ENGINE FLYWHEEL HOUSING AND MARINE TRANSMISSION FLYWHEEL HOUSING MOUNTING FACES IN PARALLEL RELATIONSHIP. ENGAGE FLYWHEEL HOUSING PILOTS AND INSTALL ALL MOUNTING CAPSCREWS USING 8.8 PROPERTY CLASS QUALITY PER ISO 898-1 [GRADE 5 QUALITY CAPSCREWS PER S.A.E. J429] TORQUED TO S574 OR SERVICE MANUAL VALUES.

* SEE SHEET 1 FOR MAXIMUM TRANSMISSION R.P.M.

** THE $WR^2$OF THE INNER/SECONDARY PARTS INCLUDES HUB AND 1/4 SHAFT $C_2$.

FOR OTHER TRANSMISSION MASS ELASTIC DATA, REFER TO B3504AE.

FOR OTHER TRANSMISSION INSTALLATION DIMENSIONS, REFER TO 1016249, SHEET 2.

ALL COUPLINGS ABOVE HAVE TORSIONAL STOP INCLUDED.

△ SECURE FLEXIBLE COUPLING TO HOUSING S.A.E. FLANGE HOLES, USING STANDARD METHOD, BEFORE SHIPMENT OF UNIT.

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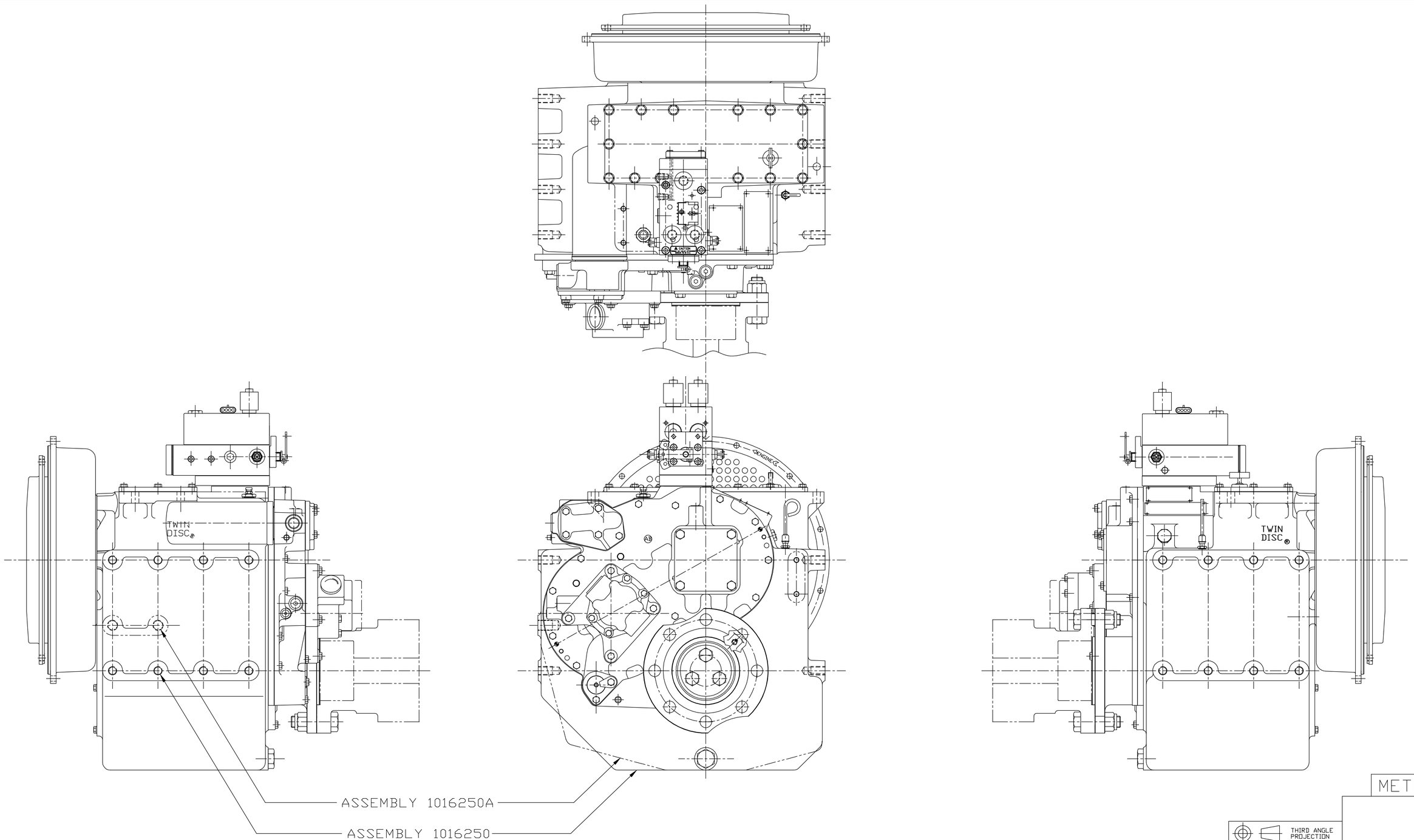
METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

MATERIAL
HEAT TREAT
SURFACE TREATMENT
WEIGHT LBS. | WR² LBS. IN²
FIRST USE
ASSY.
MODEL
NAME MG-5204SC MARINE TRANSMISSION
UNLESS OTHERWISE SPECIFIED
MACHINED DIMENSIONS
XX ±0.030
XXX ±0.010
XXXX ±0.005
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982
DATE 8-1-95
SCALE .5=1mm
DRN. AZ
CHK. DAS
APPD. DAS
TWIN DISC INCORPORATED RACINE, WI 53403 - USA
1016250
1016250A
SHEET 4 OF 5 REV AD

E D C B A

6 5 4 3 2 1




METRIC

THIRD ANGLE PROJECTION

SIMILAR TO

ⒶWAS EX8487-32

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| | |
|---|---|
| MATERIAL | |
| HEAT TREAT | |
| SURFACE TREATMENT | |
| WEIGHT LBS. | WR² LBS. IN² |
| FIRST USE ASSY. MODEL | |
| NAME | MG-5204SC MARINE TRANSMISSION |

UNLESS OTHERWISE SPECIFIED
MACHINED DIMENSIONS
X.X ±0.030
X.XX ±0.010
X.XXX ±0.005
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

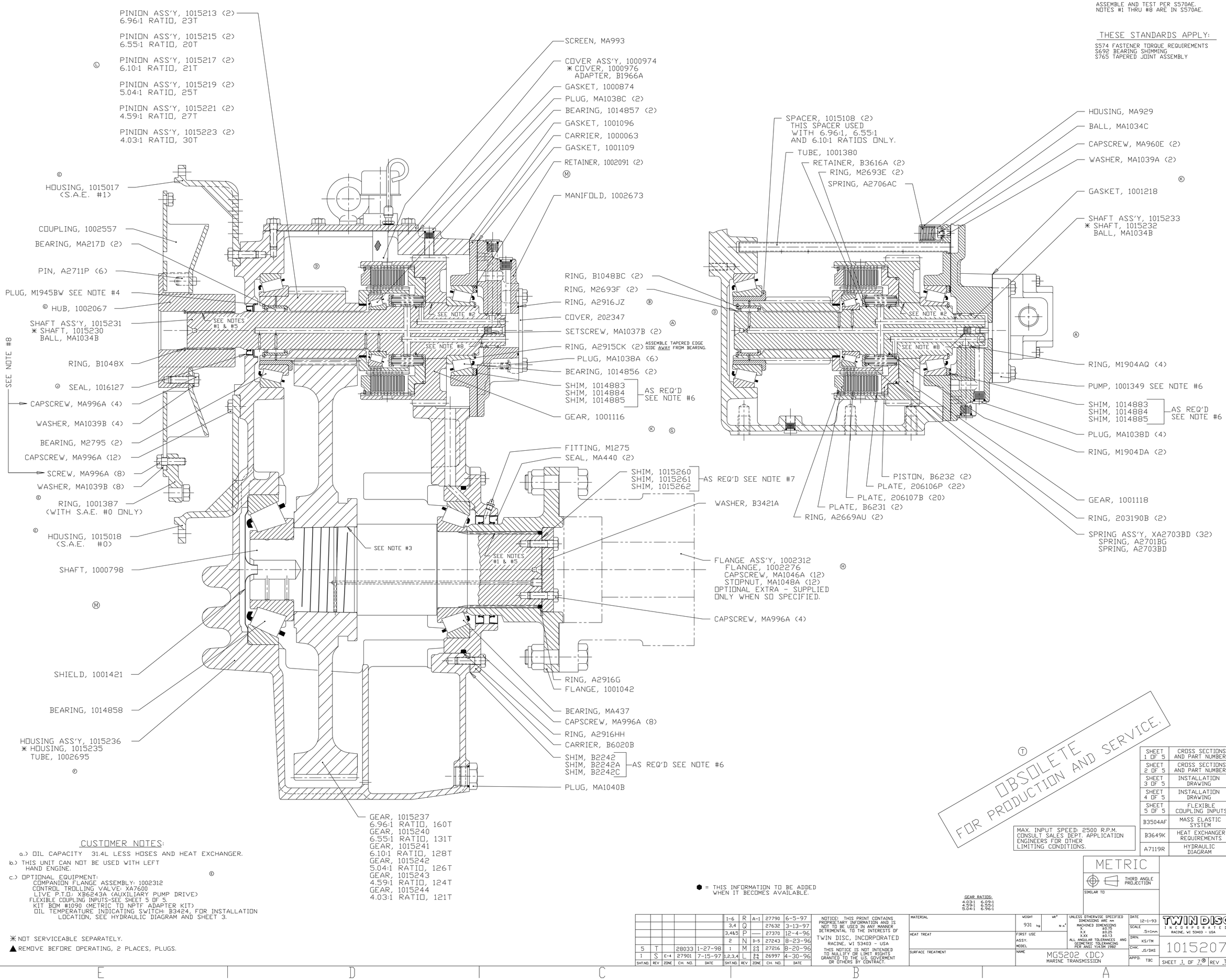
| | |
|---|---|
| DATE | 8-28-95 |
| SCALE | .25=1.00 |
| DRN. | KDS |
| CHK. | DAS |
| APPD. | DAS |

TWIN DISC INCORPORATED
RACINE, WI 53403 - USA

1016250
1016250A

SHEET 5 OF 5 REV AD

F E D C B A ®




## ASSEMBLY INSTRUCTIONS:

ASSEMBLE AND TEST PER S570AE.
NOTES #1 THRU #8 ARE IN S570AE.

## THESE STANDARDS APPLY:

S574 FASTENER TORQUE REQUIREMENTS
S692 BEARING SHIMMING
S765 TAPERED JOINT ASSEMBLY

## CUSTOMER NOTES:

a.) OIL CAPACITY 31.4L LESS HOSES AND HEAT EXCHANGER.
b.) THIS UNIT CAN NOT BE USED WITH LEFT HAND ENGINE.
c.) OPTIONAL EQUIPMENT:
COMPANION FLANGE ASSEMBLY: 1002312
CONTROL TROLLING VALVE: XA7600
LIVE P.T.O.: XB6243A (AUXILIARY PUMP DRIVE)
FLEXIBLE COUPLING INPUTS-SEE SHEET 5 OF 5.
KIT BOM #1090 (METRIC TO NPTF ADAPTER KIT)
OIL TEMPERATURE INDICATING SWITCH: B3424, FOR INSTALLATION LOCATION, SEE HYDRAULIC DIAGRAM AND SHEET 3.

* NOT SERVICEABLE SEPARATELY.
▲ REMOVE BEFORE OPERATING, 2 PLACES, PLUGS.

⬢ = THIS INFORMATION TO BE ADDED WHEN IT BECOMES AVAILABLE.

GEAR RATIOS:
4.03:1 6.09:1
4.59:1 6.55:1
5.04:1 6.96:1

OBSOLETE
FOR PRODUCTION AND SERVICE.

MAX. INPUT SPEED: 2500 R.P.M.
CONSULT SALES DEPT. APPLICATION ENGINEERS FOR OTHER LIMITING CONDITIONS.


| | |
|---|---|
| SHEET 1 OF 5 | CROSS SECTIONS AND PART NUMBERS |
| SHEET 2 OF 5 | CROSS SECTIONS AND PART NUMBERS |
| SHEET 3 OF 5 | INSTALLATION DRAWING |
| SHEET 4 OF 5 | INSTALLATION DRAWING |
| SHEET 5 OF 5 | FLEXIBLE COUPLING INPUTS |
| B3504AF | MASS ELASTIC SYSTEM |
| B3649K | HEAT EXCHANGER REQUIREMENTS |
| A7119R | HYDRAULIC DIAGRAM |


METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 1-6 | R | A-1 | 27790 | 6-5-97 |
| | | | | | | 3,4 | Q | | 27632 | 3-13-97 |
| | | | | | | 3,4&5 | P | — | 27370 | 12-4-96 |
| | | | | | | 2 | N | D-5 | 27243 | 8-23-96 |
| 5 | T | | 28033 | 1-27-98 | | 1 | M | E-3 F-3 | 27216 | 8-20-96 |
| 1 | S | E-4 | 27901 | 7-15-97 | | 1,2,3,4 | L | E-4 F-4 | 26997 | 4-30-96 |
| SHT.NO. | REV | ZONE | CH. NO. | DATE | | SHT.NO. | REV | ZONE | CH. NO. | DATE |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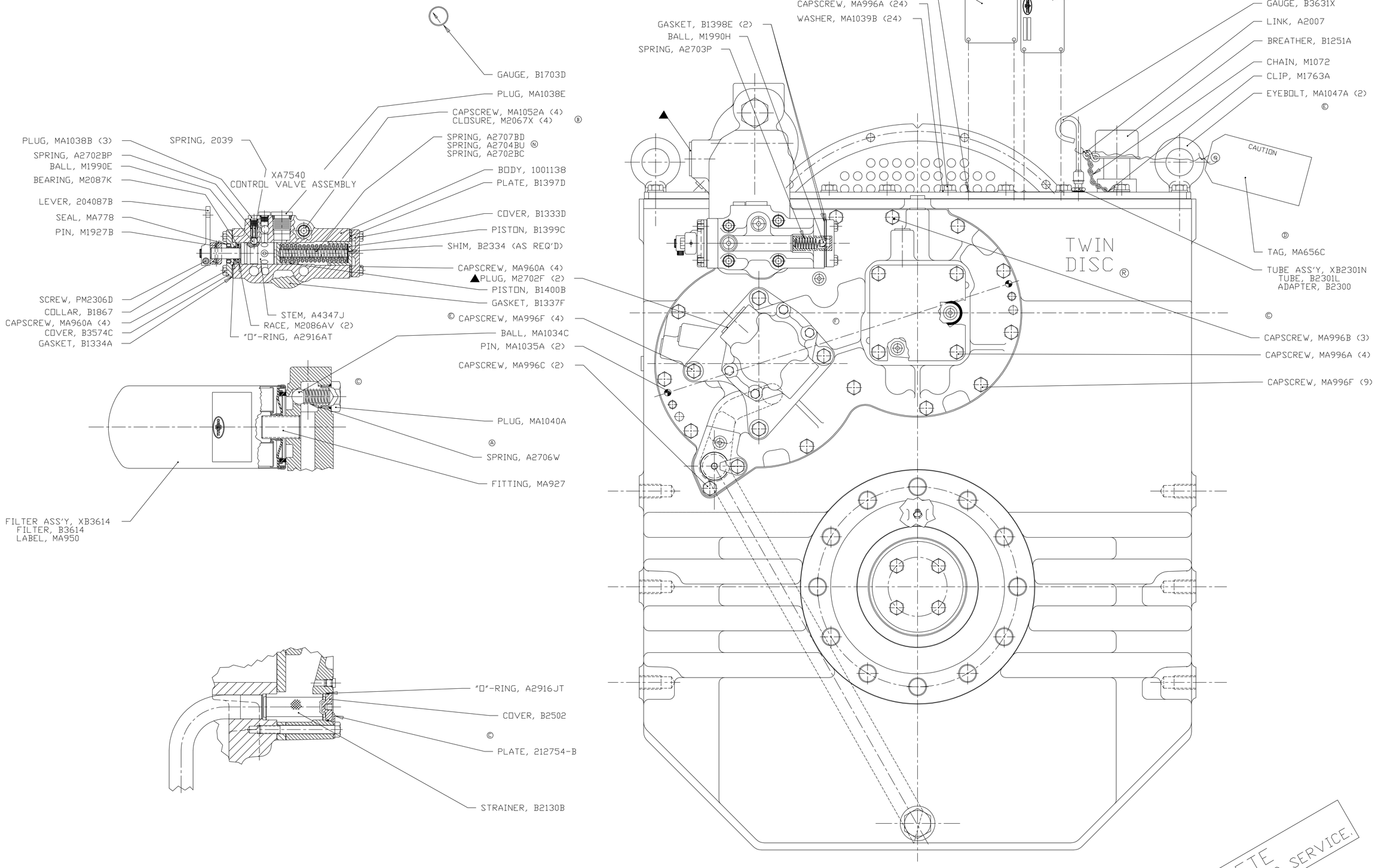
| | |
|---|---|
| MATERIAL | |
| HEAT TREAT | |
| SURFACE TREATMENT | |
| WEIGHT | 931 kg |
| FIRST USE | |
| ASSY. MODEL | MG5202 (DC) MARINE TRANSMISSION |
| NAME | |
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm | MACHINED DIMENSIONS X ±0.75, X.X ±0.25, X.XX ±0.13 |
| ALL ANGULAR TOLERANCES ANG GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982 | |
| DATE | 12-1-93 |
| SCALE | .5=1mm |
| DRN. | KS/TM |
| CHK. | JS/DAS |
| APPD. | TBC |

TWIN DISC INCORPORATED
RACINE, WI 53403 - USA

1015207

SHEET 1 OF 7 REV T




OBSOLETE
FOR PRODUCTION AND SERVICE.

| | | | | | | |
|---|---|---|---|---|---|---|
| METRIC | | | | | | |
| THIRD ANGLE PROJECTION | | | | | | |
| SIMILAR TO | | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| NOTICE! THIS PRINT CONTAINS PROPRIETARY INFORMATION AND IS NOT TO BE USED IN ANY MANNER DETRIMENTAL TO THE INTERESTS OF TWIN DISC, INCORPORATED RACINE, WI 53403 - USA THIS NOTICE IS NOT INTENDED TO NULLIFY OR LIMIT RIGHTS GRANTED TO THE U.S. GOVERMENT OR OTHERS BY CONTRACT. | MATERIAL | WEIGHT kg / $w^2$ N·m² | UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm MACHINED DIMENSIONS X. ±0.75 X.X ±0.25 X.XX ±0.13 ALL ANGULAR TOLERANCES ANG GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982 | DATE 12-1-93 | TWIN DISC INCORPORATED RACINE, WI 53403 - USA |
| | HEAT TREAT | FIRST USE ASSY. MODEL | | SCALE .5=1mm | |
| | SURFACE TREATMENT | NAME MG5202 (DC) MARINE TRANSMISSION | | DRN. KS/TM CHK. JS DAS APPD. TBC | 1015207 |
| | | | | | SHEET 2 OF 7 Ⓝ REV I |

E D C B A

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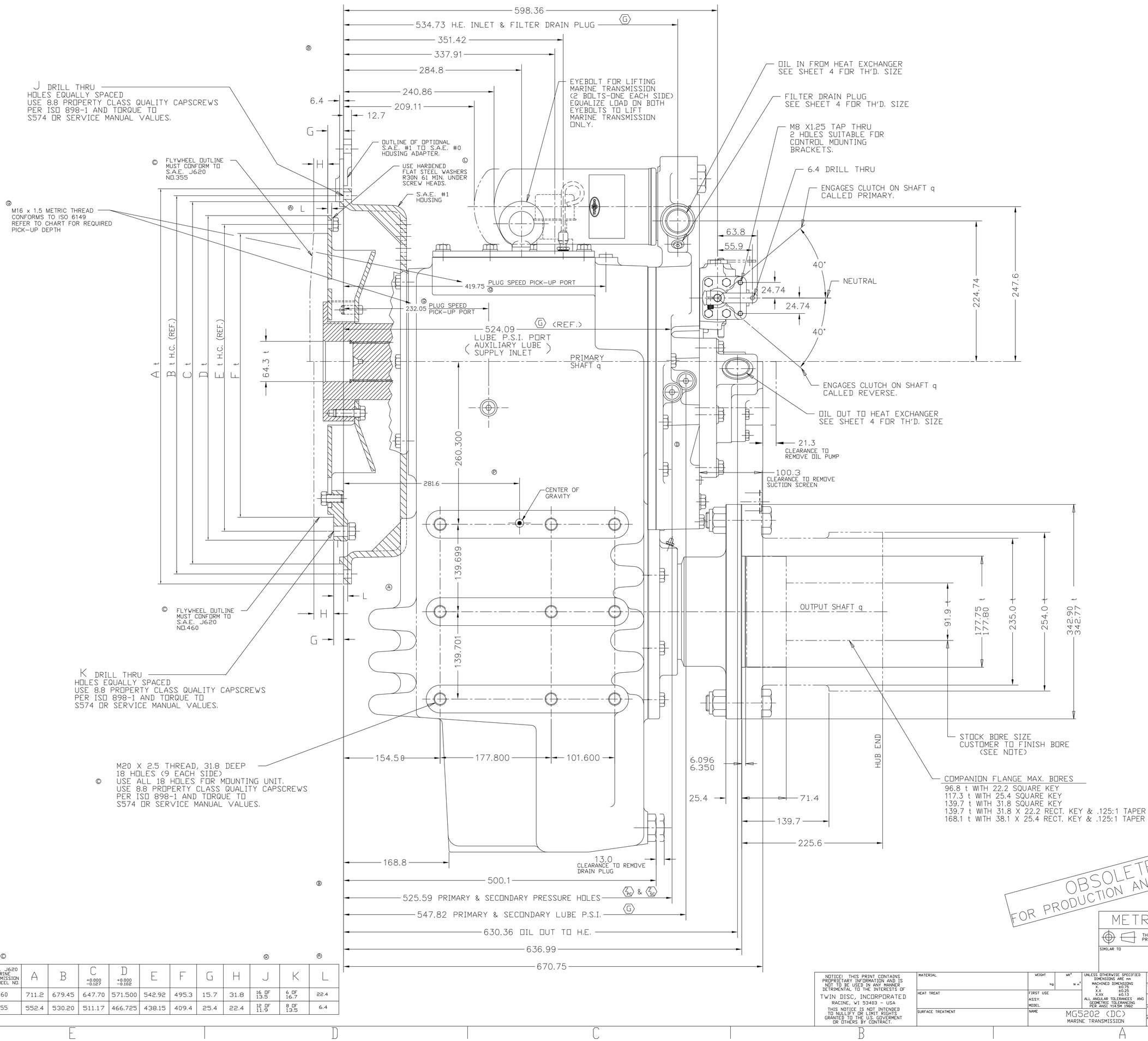
598.36
534.73 H.E. INLET & FILTER DRAIN PLUG
351.42
337.91
284.8
240.86
209.11
12.7
6.4
J DRILL THRU HOLES EQUALLY SPACED USE 8.8 PROPERTY CLASS QUALITY CAPSCREWS PER ISO 898-1 AND TORQUE TO S574 OR SERVICE MANUAL VALUES.
EYEBOLT FOR LIFTING MARINE TRANSMISSION (2 BOLTS-ONE EACH SIDE) EQUALIZE LOAD ON BOTH EYEBOLTS TO LIFT MARINE TRANSMISSION ONLY.
OIL IN FROM HEAT EXCHANGER SEE SHEET 4 FOR TH'D. SIZE
FILTER DRAIN PLUG SEE SHEET 4 FOR TH'D. SIZE
M8 X1.25 TAP THRU 2 HOLES SUITABLE FOR CONTROL MOUNTING BRACKETS.
6.4 DRILL THRU
ENGAGES CLUTCH ON SHAFT q CALLED PRIMARY.
OUTLINE OF OPTIONAL S.A.E. #1 TO S.A.E. #0 HOUSING ADAPTER.
FLYWHEEL OUTLINE MUST CONFORM TO S.A.E. J620 NO.355
USE HARDENED FLAT STEEL WASHERS R30N 61 MIN. UNDER SCREW HEADS.
S.A.E. #1 HOUSING
M16 x 1.5 METRIC THREAD CONFORMS TO ISO 6149 REFER TO CHART FOR REQUIRED PICK-UP DEPTH
63.8
55.9
40°
NEUTRAL
24.74
24.74
40°
224.74
247.6
419.75 PLUG SPEED PICK-UP PORT
232.05 PLUG SPEED PICK-UP PORT
524.09 (REF.) LUBE P.S.I. PORT AUXILIARY LUBE SUPPLY INLET
PRIMARY SHAFT q
ENGAGES CLUTCH ON SHAFT q CALLED REVERSE.
OIL OUT TO HEAT EXCHANGER SEE SHEET 4 FOR TH'D. SIZE
21.3 CLEARANCE TO REMOVE OIL PUMP
100.3 CLEARANCE TO REMOVE SUCTION SCREEN
A t
B t H.C. (REF.)
C t
D t
E t H.C. (REF.)
F t
64.3 t
260.300
281.6
CENTER OF GRAVITY
139.699
139.701
OUTPUT SHAFT q
91.9 t
177.75 t
177.80
235.0 t
254.0 t
342.90 t
342.77
K DRILL THRU HOLES EQUALLY SPACED USE 8.8 PROPERTY CLASS QUALITY CAPSCREWS PER ISO 898-1 AND TORQUE TO S574 OR SERVICE MANUAL VALUES.
FLYWHEEL OUTLINE MUST CONFORM TO S.A.E. J620 NO.460
STOCK BORE SIZE CUSTOMER TO FINISH BORE (SEE NOTE)
COMPANION FLANGE MAX. BORES
96.8 t WITH 22.2 SQUARE KEY
117.3 t WITH 25.4 SQUARE KEY
139.7 t WITH 31.8 SQUARE KEY
139.7 t WITH 31.8 X 22.2 RECT. KEY & .125:1 TAPER
168.1 t WITH 38.1 X 25.4 RECT. KEY & .125:1 TAPER
M20 X 2.5 THREAD, 31.8 DEEP 18 HOLES (9 EACH SIDE) USE ALL 18 HOLES FOR MOUNTING UNIT. USE 8.8 PROPERTY CLASS QUALITY CAPSCREWS PER ISO 898-1 AND TORQUE TO S574 OR SERVICE MANUAL VALUES.
154.50
177.800
101.600
6.096
6.350
25.4
71.4
139.7
225.6
HUB END
168.8
13.0 CLEARANCE TO REMOVE DRAIN PLUG
500.1
525.59 PRIMARY & SECONDARY PRESSURE HOLES
547.82 PRIMARY & SECONDARY LUBE P.S.I.
630.36 OIL OUT TO H.E.
636.99
670.75

| SAE NO | S.A.E. J620 MARINE TRANSMISSION FLYWHEEL NO. | A | B | C +0.000 -0.127 | D +0.000 -0.102 | E | F | G | H | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 460 | 711.2 | 679.45 | 647.70 | 571.500 | 542.92 | 495.3 | 15.7 | 31.8 | 16 OF 13.5 | 6 OF 16.7 | 22.4 |
| 1 | 355 | 552.4 | 530.20 | 511.17 | 466.725 | 438.15 | 409.4 | 25.4 | 22.4 | 12 OF 11.9 | 8 OF 13.5 | 6.4 |

OBSOLETE
FOR PRODUCTION AND SERVICE.

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

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MATERIAL
HEAT TREAT
SURFACE TREATMENT
WEIGHT kg
WR² N m²
FIRST USE
ASSY.
MODEL
NAME MG5202 (DC) MARINE TRANSMISSION

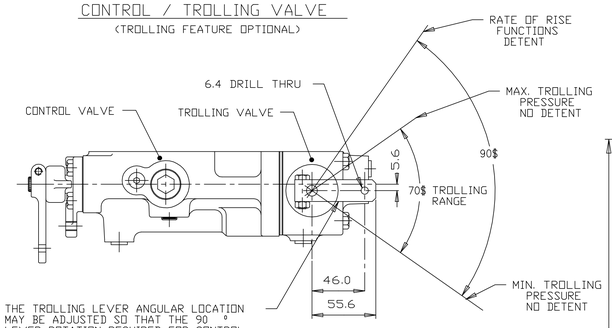
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ANG GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 12-1-93
SCALE .5=1mm
DRN. KS/TM
CHK. JS DAS
APPD. TBC

TWIN DISC INCORPORATED RACINE, WI 53403 - USA
1015207
SHEET 3 OF 7 REV T_

## CONTROL / TROLLING VALVE

(TROLLING FEATURE OPTIONAL)




THE TROLLING LEVER ANGULAR LOCATION MAY BE ADJUSTED SO THAT THE 90 ° LEVER ROTATION REQUIRED FOR CONTROL FALLS ANYWHERE WITHIN THE 360 ° RANGE IN WHICH THE LEVER MAY BE LOCATED.

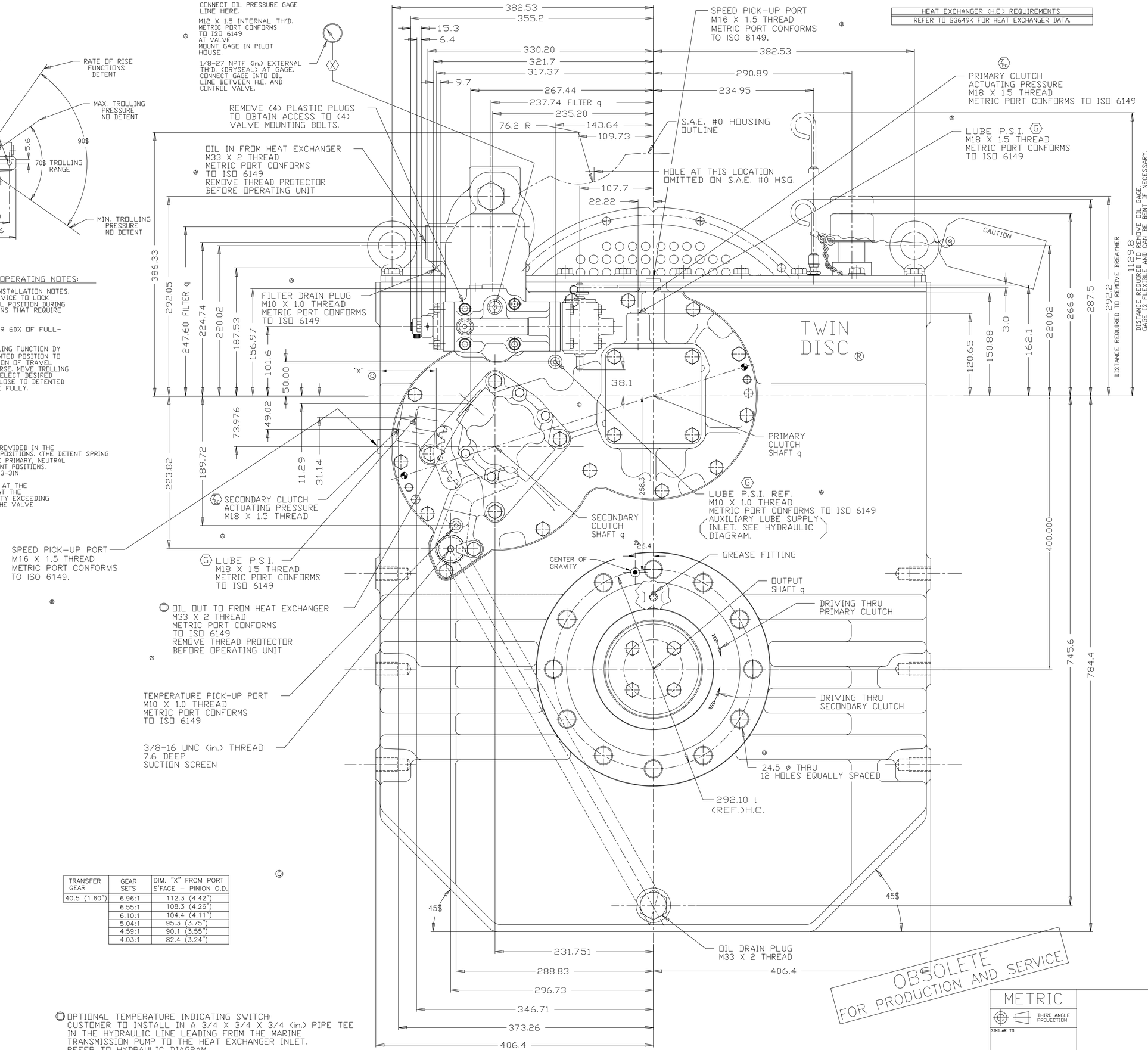
### (OPTIONAL) TROLLING VALVE INSTALLATION AND OPERATING NOTES:

1.) REFER TO VALVE ASSEMBLY DRAWING FOR ADDITIONAL INSTALLATION NOTES. CONTROL HEAD FOR TROLLING VALVE MUST INCLUDE A DEVICE TO LOCK TROLLING VALVE CONTROL LEVER IN DETENTED NO-TROLL POSITION DURING MANEUVERING, DOCKING AND OTHER OPERATING CONDITIONS THAT REQUIRE FULL POWER TO THE PROPELLER.

2.) MAXIMUM ENGINE SPEED WHILE TROLLING, 1100 R.P.M. OR 60% OF FULL-LOAD ENGINE SPEED, WHICHEVER IS SMALLER.

3.) WITH CONTROL VALVE LEVER IN NEUTRAL, SELECT TROLLING FUNCTION BY MOVING TROLLING CONTROL LEVER OUT OF LOCKED DETENTED POSITION TO MAXIMUM TROLLING POSITION. SELECT TROLLING DIRECTION OF TRAVEL BY MOVING CONTROL VALVE LEVER TO FORWARD OR REVERSE. MOVE TROLLING CONTROL LEVER FROM MINIMUM TROLLING POSITION TO SELECT DESIRED TROLLING SPEED. WHEN TROLLING LEVER IS ADVANCED CLOSE TO DETENTED NO-TROLL POSITION, THE TROLLING CLUTCH MAY ENGAGE FULLY.

CONTROL VALVE:
444-133 N AT THE 56.0 R LOCATION OF THE 6.35 DIA. HOLE IS REQUIRED TO OVERCOME DETENT EFFORT. THE DETENT FEATURE IS PROVIDED IN THE FULL PRIMARY CLUTCH, FULL SECONDARY CLUTCH AND NEUTRAL LEVER POSITIONS. (THE DETENT SPRING AND PIN MAY BE OMITTED WHEN REMOTE CONTROL SYSTEMS PROVIDE THE PRIMARY, NEUTRAL AND SECONDARY DETENTS THAT CORRESPOND EXACTLY WITH VALVE DETENT POSITIONS. FORCE AT THE LEVER HOLE TO OPERATE THE VALVE THEN REDUCES TO 13-31N THE REMOTE CONTROL VALVE ACTUATOR MUST PROVIDE #35.8 LINEAR TRAVEL FROM NEUTRAL AT THE 6.35 DIA. HOLE LOCATION. ROTATIONAL STOPS AT THE STATED VALVE TRAVEL LIMITS HAVE A MAXIMUM CAPACITY OF 445 N AT THE 6.35 DIA. HOLE LOCATION. VALVE ACTUATORS WITH FORCE CAPABILITY EXCEEDING THIS LIMIT MUST HAVE SEPARATE STOPPING DEVICES SO CAPACITY OF THE VALVE ROTATIONAL STOPS IS NOT EXCEEDED. EXCEEDING THE CAPACITY OF THE VALVE ROTATIONAL STOPS CAN CAUSE LOSS OF CONTROL.


CONNECT OIL PRESSURE GAGE LINE HERE.
M12 X 1.5 INTERNAL TH'D. METRIC PORT CONFORMS TO ISO 6149 AT VALVE MOUNT GAGE IN PILOT HOUSE.
1/8-27 NPTF (in.) EXTERNAL TH'D. (DRYSEAL) AT GAGE. CONNECT GAGE INTO OIL LINE BETWEEN H.E. AND CONTROL VALVE.
HEAT EXCHANGER (H.E.) REQUIREMENTS
REFER TO B3649K FOR HEAT EXCHANGER DATA.
SPEED PICK-UP PORT M16 X 1.5 THREAD METRIC PORT CONFORMS TO ISO 6149.
PRIMARY CLUTCH ACTUATING PRESSURE M18 X 1.5 THREAD METRIC PORT CONFORMS TO ISO 6149
REMOVE (4) PLASTIC PLUGS TO OBTAIN ACCESS TO (4) VALVE MOUNTING BOLTS.
S.A.E. #0 HOUSING OUTLINE
LUBE P.S.I. M18 X 1.5 THREAD METRIC PORT CONFORMS TO ISO 6149
OIL IN FROM HEAT EXCHANGER M33 X 2 THREAD METRIC PORT CONFORMS TO ISO 6149 REMOVE THREAD PROTECTOR BEFORE OPERATING UNIT
HOLE AT THIS LOCATION OMITTED ON S.A.E. #0 HSG.
CAUTION
DISTANCE REQUIRED TO REMOVE BREATHER
DISTANCE REQUIRED TO REMOVE OIL GAGE. GAGE IS FLEXIBLE AND CAN BE BENT IF NECESSARY.
FILTER DRAIN PLUG M10 X 1.0 THREAD METRIC PORT CONFORMS TO ISO 6149
TWIN DISC
PRIMARY CLUTCH SHAFT q
SECONDARY CLUTCH ACTUATING PRESSURE M18 X 1.5 THREAD
LUBE P.S.I. REF. M10 X 1.0 THREAD METRIC PORT CONFORMS TO ISO 6149
AUXILIARY LUBE SUPPLY INLET. SEE HYDRAULIC DIAGRAM.
SECONDARY CLUTCH SHAFT q
SPEED PICK-UP PORT M16 X 1.5 THREAD METRIC PORT CONFORMS TO ISO 6149.
LUBE P.S.I. M18 X 1.5 THREAD METRIC PORT CONFORMS TO ISO 6149
CENTER OF GRAVITY
GREASE FITTING
OUTPUT SHAFT q
DRIVING THRU PRIMARY CLUTCH
OIL OUT TO FROM HEAT EXCHANGER M33 X 2 THREAD METRIC PORT CONFORMS TO ISO 6149 REMOVE THREAD PROTECTOR BEFORE OPERATING UNIT
DRIVING THRU SECONDARY CLUTCH
TEMPERATURE PICK-UP PORT M10 X 1.0 THREAD METRIC PORT CONFORMS TO ISO 6149
3/8-16 UNC (in.) THREAD 7.6 DEEP SUCTION SCREEN
24.5 ø THRU 12 HOLES EQUALLY SPACED
292.10 t (REF.)H.C.
OIL DRAIN PLUG M33 X 2 THREAD
45$
45$
382.53
355.2
15.3
6.4
330.20
321.7
317.37
9.7
267.44
237.74 FILTER q
235.20
76.2 R
143.64
109.73
107.7
22.22
386.33
292.05
247.60 FILTER q
224.74
220.02
187.53
156.97
101.6
50.00
"X"
38.1
73.976
49.02
11.29
31.14
223.82
189.72
258.3
26.4
120.65
150.88
3.0
162.1
220.02
266.8
287.5
292.2
1129.8
400.000
745.6
784.4
231.751
288.83
296.73
346.71
373.26
406.4

| TRANSFER GEAR | GEAR SETS | DIM. "X" FROM PORT S'FACE – PINION O.D. |
|---|---|---|
| 40.5 (1.60") | 6.96:1 | 112.3 (4.42") |
| | 6.55:1 | 108.3 (4.26") |
| | 6.10:1 | 104.4 (4.11") |
| | 5.04:1 | 95.3 (3.75") |
| | 4.59:1 | 90.1 (3.55") |
| | 4.03:1 | 82.4 (3.24") |

OPTIONAL TEMPERATURE INDICATING SWITCH:
CUSTOMER TO INSTALL IN A 3/4 X 3/4 X 3/4 (in.) PIPE TEE IN THE HYDRAULIC LINE LEADING FROM THE MARINE TRANSMISSION PUMP TO THE HEAT EXCHANGER INLET. REFER TO HYDRAULIC DIAGRAM.

NOTE:
ALL POINTS AVAILABLE FOR TESTING ARE CODED ⬡.

OBSOLETE
FOR PRODUCTION AND SERVICE

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

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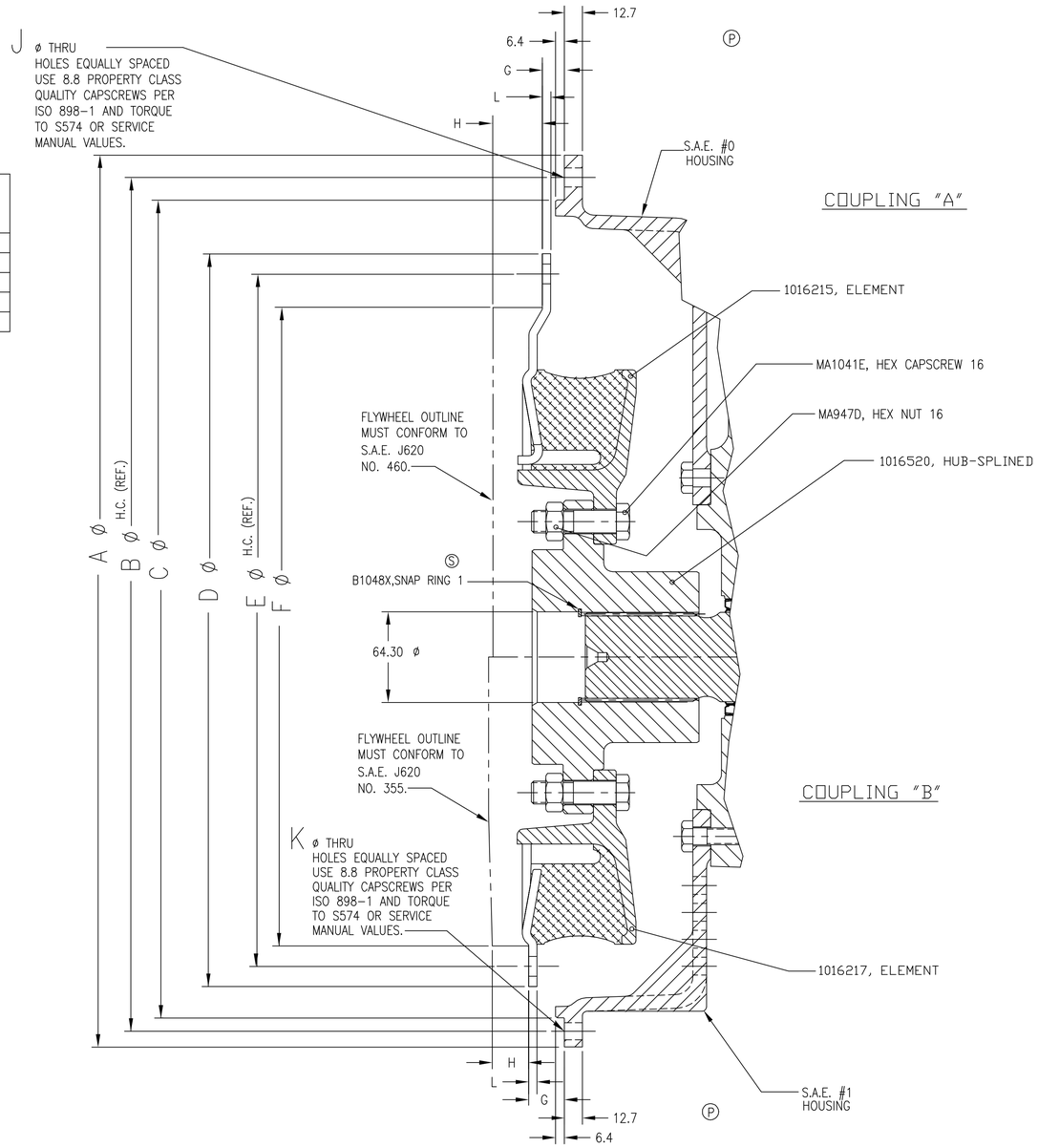
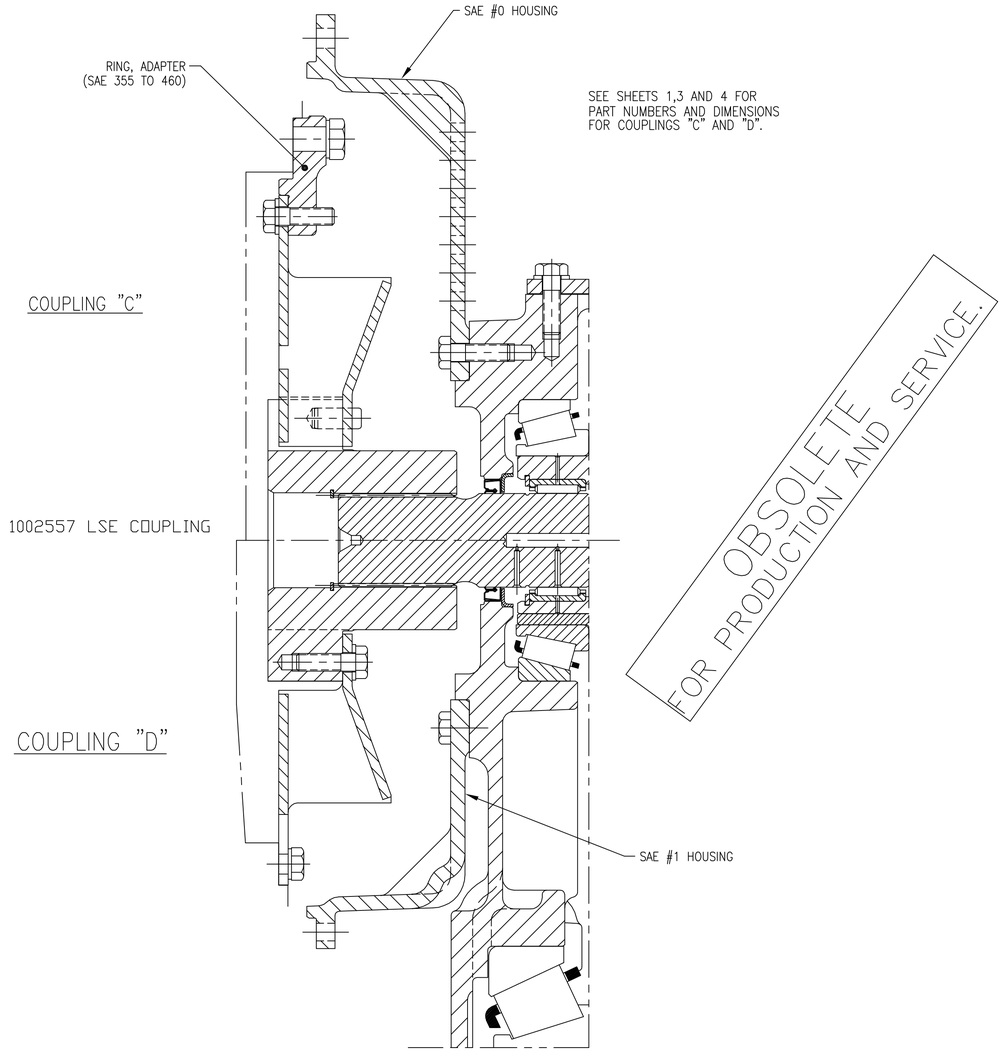
MATERIAL
HEAT TREAT
SURFACE TREATMENT
WEIGHT kg
FIRST USE
ASSY.
MODEL
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS X. ±0.75 X.X ±0.25 X.XX ±0.13
ALL ANGULAR TOLERANCES ANG GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982
NAME MG5202 (DC) MARINE TRANSMISSION
DATE 12-1-93
SCALE .5=1mm
DRN. KS/TM
CHK JS DAS
APPD. TBC
TWIN DISC INCORPORATED RACINE, WI 53403 - USA
1015207
SHEET 4 OF 7 REV T

E D C B A
6 5 4 3 2 1

| TORQUE kN-m | DYNAMIC TORSIONAL STIFFNESS kN-m/rad |
|---|---|
| 0.50 | 19.4 |
| 1.25 | 19.9 |
| 2.50 | 23.1 |
| 3.75 | 33.9 |
| 5.00 | 47.0 |





SAE #0 HOUSING
RING, ADAPTER (SAE 355 TO 460)
SEE SHEETS 1,3 AND 4 FOR PART NUMBERS AND DIMENSIONS FOR COUPLINGS "C" AND "D".
COUPLING "C"
1002557 LSE COUPLING
COUPLING "D"
SAE #1 HOUSING

OBSOLETE
FOR PRODUCTION AND SERVICE.

| COUPLING | SAE J620 FLYWHEEL SIZE | COUPLING NO. | MAX. COUPLING rpm* | NOMINAL TORQUE kN-m | DYNAMIC TORSIONAL STIFFNESS kN-m/rad | COUPLING WR² kg-m² ** OUTER PARTS | COUPLING WR² kg-m² ** INNER PARTS | COUPLING WEIGHT kg WITHOUT HUB | COUPLING WEIGHT kg WITH HUB |
|---|---|---|---|---|---|---|---|---|---|
| C | NO. 460 | LS14E-4400 WITH 1001387 RING | 2500 | 3.12 | 21.2 | 0.66 WITH RING | 0.17 | 9.7 WITHOUT RING | 28.8 WITH RING |
| D | NO. 355 | LS14E-4400 | 2500 | 3.12 | 21.2 | 0.21 | 0.17 | 9.7 | 21.5 |

| COUPLING | SAE J620 FLYWHEEL SIZE | COUPLING NO. | MAX. COUPLING rpm* | NOMINAL TORQUE kN-m | DYNAMIC TORSIONAL STIFFNESS | COUPLING WR² kg-m² ** OUTER PARTS | COUPLING WR² kg-m² ** INNER PARTS | COUPLING WEIGHT kg WITHOUT HUB | COUPLING WEIGHT kg WITH HUB |
|---|---|---|---|---|---|---|---|---|---|
| A | NO. 460 | VKE 4911S -4000/18 | 2750 | 5.00 | PER CHART | 0.61 | 0.41 | 27.7 | 40.7 |
| B | NO. 355 | VKE 4911S -4000/14 | 2750 | 5.00 | PER CHART | 0.24 | 0.41 | 23.7 | 36.7 |

| SAE NO | S.A.E. J620 MARINE TRANSMISSION FLYWHEEL NO. | A | B | C +0.000 -0.127 | D +0.000 -0.102 | E | F | G | H | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 460 | 711.2 | 679.45 | 647.70 | 571.50 | 542.92 | 498.3 | 15.7 | 35.0 | 16 OF 13.5 | 6 OF 16.7 | 6.0 |
| 1 | 355 | 552.4 | 530.20 | 511.17 | 466.725 | 438.15 | 409.4 | 25.4 | 25.7 | 12 OF 11.9 | 8 OF 13.5 | 6.3 |

Ⓠ

FOR TRANSMISSION/COUPLING ASSEMBLY TO ENGINE:
INSTALL COUPLING AND HUB TO ENGINE FLYWHEEL.
ADVANCE MARINE TRANSMISSION INTO POSITION WITH ENGINE FLYWHEEL HOUSING MOUNTING FLANGE. LINE UP INPUT SHAFT EXTERNAL SPLINE WITH INTERNAL SPLINE IN COUPLING HUB AND MOVE ENGINE AND MARINE TRANSMISSION TOGETHER MAINTAINING ENGINE FLYWHEEL HOUSING AND MARINE TRANSMISSION FLYWHEEL HOUSING MOUNTING FACES IN PARALLEL RELATIONSHIP. ENGAGE FLYWHEEL HOUSING PILOTS AND INSTALL ALL MOUNTING CAPSCREWS USING 8.8 PROPERTY CLASS QUALITY PER ISO 898-1 [GRADE 5 QUALITY CAPSCREWS PER S.A.E. J429] TORQUED TO S574 OR SERVICE MANUAL VALUES.

* SEE SHEET 1 FOR MAXIMUM TRANSMISSION R.P.M.
** THE WR²OF INNER PARTS INCLUDES HUB AND 1/4 SHAFT C².
FOR OTHER TRANSMISSION MASS ELASTIC DATA, REFER TO B3504AF.

ALL COUPLINGS ABOVE HAVE TORSIONAL STOP INCLUDED. FOR OTHER TRANSMISSION INSTALLATION DIMENSIONS, REFER TO 1015207 SHEETS 3 AND 4.

△ FOR TRANSMISSION SHIPMENT: SECURE FLEXIBLE COUPLING TO HOUSING S.A.E FLANGE HOLES, USING STANDARD METHOD, BEFORE SHIPMENT OF UNIT.

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MATERIAL
HEAT TREAT
SURFACE TREATMENT
WEIGHT kg
WR² N m²
FIRST USE
ASSY.
MODEL
NAME MG5202 (DC) MARINE TRANSMISSION (FLEXIBLE COUPLING INPUTS)

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X. ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ANG GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 1-5-95
SCALE .50=1.00
DRN. KS
CHK. DAS
APPD. TBC

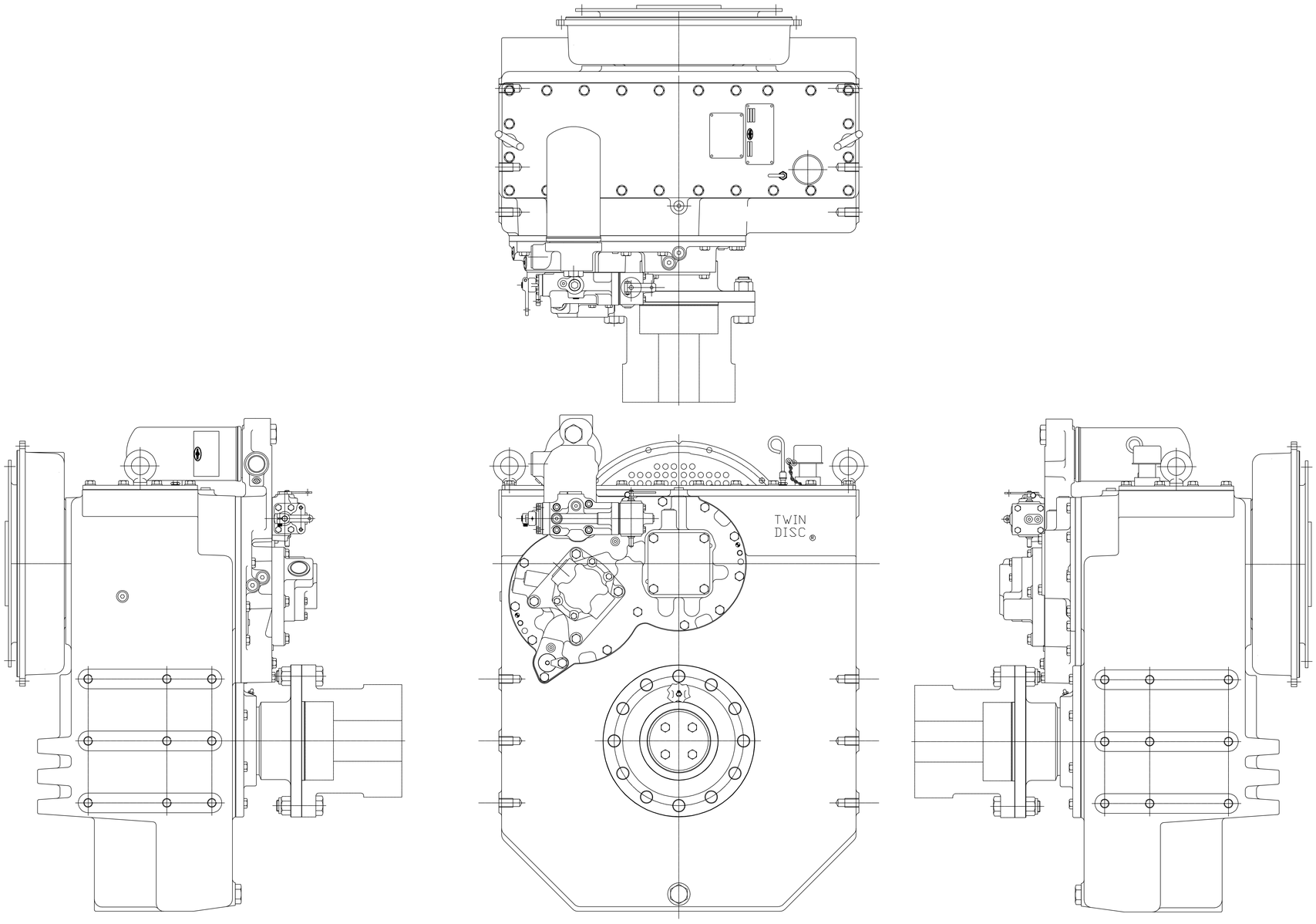
METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

TWIN DISC INCORPORATED RACINE, WI 53403 - USA

1015207

SHEET 5 OF 7® REV T

F E C B A




OBSOLETE
FOR PRODUCTION AND SERVICE.

S.A.E. #1 HOUSING

METRIC
THIRD ANGLE PROJECTION

SIMILAR TO

Ⓐ WAS EX8487-30

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MATERIAL
HEAT TREAT
SURFACE TREATMENT
WEIGHT kg
WR² N·m²
FIRST USE
ASSY.
MODEL
NAME MG5202 (D.C.) MARINE TRANSMISSION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1° GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 4-12-94
SCALE 25=1.00
DRN. AZ
CHK. JS
APPD. DAS

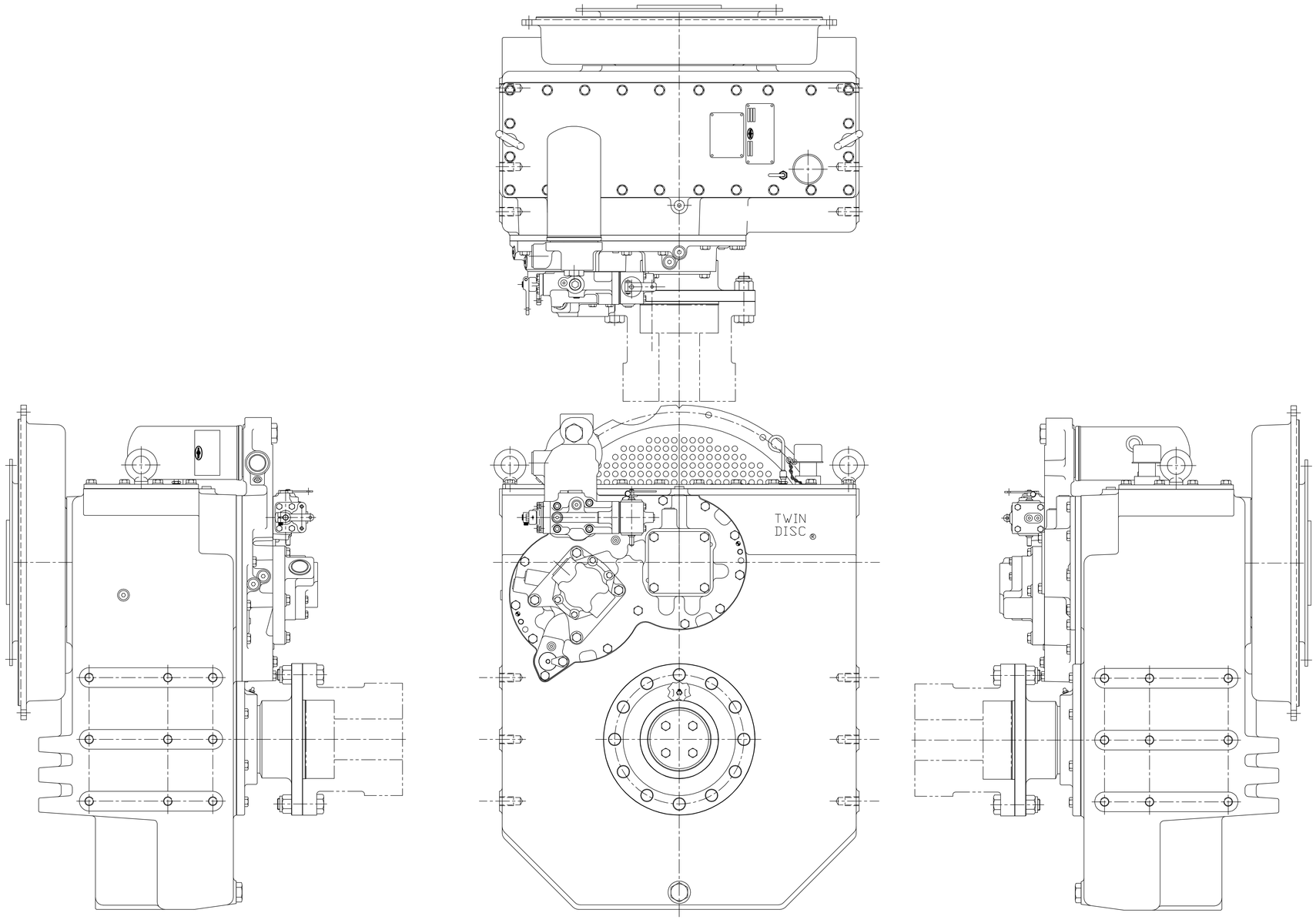
TWIN DISC INCORPORATED
RACINE, WI 53403 - USA

1015207

SHEET 6 OF 7 ® REV T.

E D C B A

6 5 4 3 2 1




OBSOLETE
FOR PRODUCTION AND SERVICE.

S.A.E. #0 HOUSING

Ⓐ WAS EX8587-48

THIRD ANGLE PROJECTION

SIMILAR TO

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MATERIAL

HEAT TREAT

SURFACE TREATMENT

WEIGHT LBS. | WR² LBS. IN²

FIRST USE
ASSY.
MODEL

NAME MG5202 (D.C.)
MARINE TRANSMISSION

UNLESS OTHERWISE SPECIFIED
MACHINED DIMENSIONS
X.X ±0.030
X.XX ±0.010
X.XXX ±0.005
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 4-12-94
SCALE .25=1.00
DRN. AZ
CHK. JS
APPD. DAS

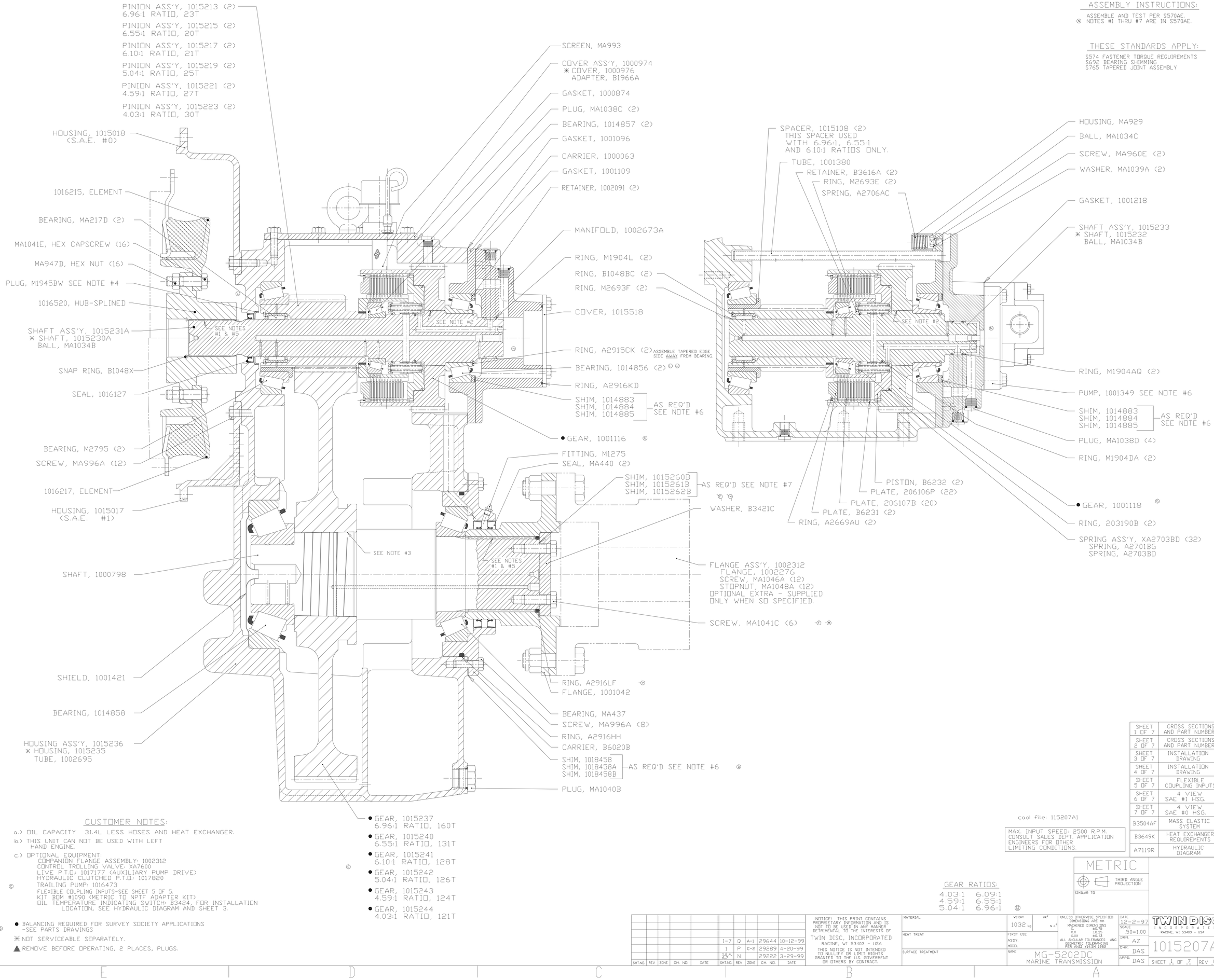
TWIN DISC INCORPORATED
RACINE, WI 53403 - USA

1015207

SHEET 1 OF 1 REV 1

E D C B A

6 5 4 3 2 1




## ASSEMBLY INSTRUCTIONS:

ASSEMBLE AND TEST PER S570AE.
Ⓝ NOTES #1 THRU #7 ARE IN S570AE.

## THESE STANDARDS APPLY:

S574 FASTENER TORQUE REQUIREMENTS
S692 BEARING SHIMMING
S765 TAPERED JOINT ASSEMBLY

## CUSTOMER NOTES:

a.) OIL CAPACITY 31.4L LESS HOSES AND HEAT EXCHANGER.
b.) THIS UNIT CAN NOT BE USED WITH LEFT HAND ENGINE.
c.) OPTIONAL EQUIPMENT:
COMPANION FLANGE ASSEMBLY: 1002312
CONTROL TROLLING VALVE: XA7600
LIVE P.T.O.: 1017177 (AUXILIARY PUMP DRIVE)
HYDRAULIC CLUTCHED P.T.O.: 1017820
© TRAILING PUMP: 1016473
FLEXIBLE COUPLING INPUTS-SEE SHEET 5 OF 5.
KIT BOM #1090 (METRIC TO NPTF ADAPTER KIT)
OIL TEMPERATURE INDICATING SWITCH: B3424, FOR INSTALLATION LOCATION, SEE HYDRAULIC DIAGRAM AND SHEET 3.

● BALANCING REQUIRED FOR SURVEY SOCIETY APPLICATIONS -SEE PARTS DRAWINGS
✳ NOT SERVICEABLE SEPARATELY.
▲ REMOVE BEFORE OPERATING, 2 PLACES, PLUGS.

## GEAR RATIOS:

| | |
|---|---|
| 4.03:1 | 6.09:1 |
| 4.59:1 | 6.55:1 |
| 5.04:1 | 6.96:1 © |

cad file: 115207A1

MAX. INPUT SPEED: 2500 R.P.M. CONSULT SALES DEPT. APPLICATION ENGINEERS FOR OTHER LIMITING CONDITIONS.

| | |
|---|---|
| SHEET 1 OF 7 | CROSS SECTIONS AND PART NUMBERS |
| SHEET 2 OF 7 | CROSS SECTIONS AND PART NUMBERS |
| SHEET 3 OF 7 | INSTALLATION DRAWING |
| SHEET 4 OF 7 | INSTALLATION DRAWING |
| SHEET 5 OF 7 | FLEXIBLE COUPLING INPUTS |
| SHEET 6 OF 7 | 4 VIEW SAE #1 HSG. |
| SHEET 7 OF 7 | 4 VIEW SAE #0 HSG. |
| B3504AF | MASS ELASTIC SYSTEM |
| B3649K | HEAT EXCHANGER REQUIREMENTS |
| A7119R | HYDRAULIC DIAGRAM |

| SHT NO. | REV | ZONE | CH. NO. | DATE |
|---|---|---|---|---|
| 1-7 | Q | A-1 | 29644 | 10-12-99 |
| 1 | P | C-2 | 29289 | 4-20-99 |
| 1,2,4, 6,7 | N | | 29222 | 3-29-99 |

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METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

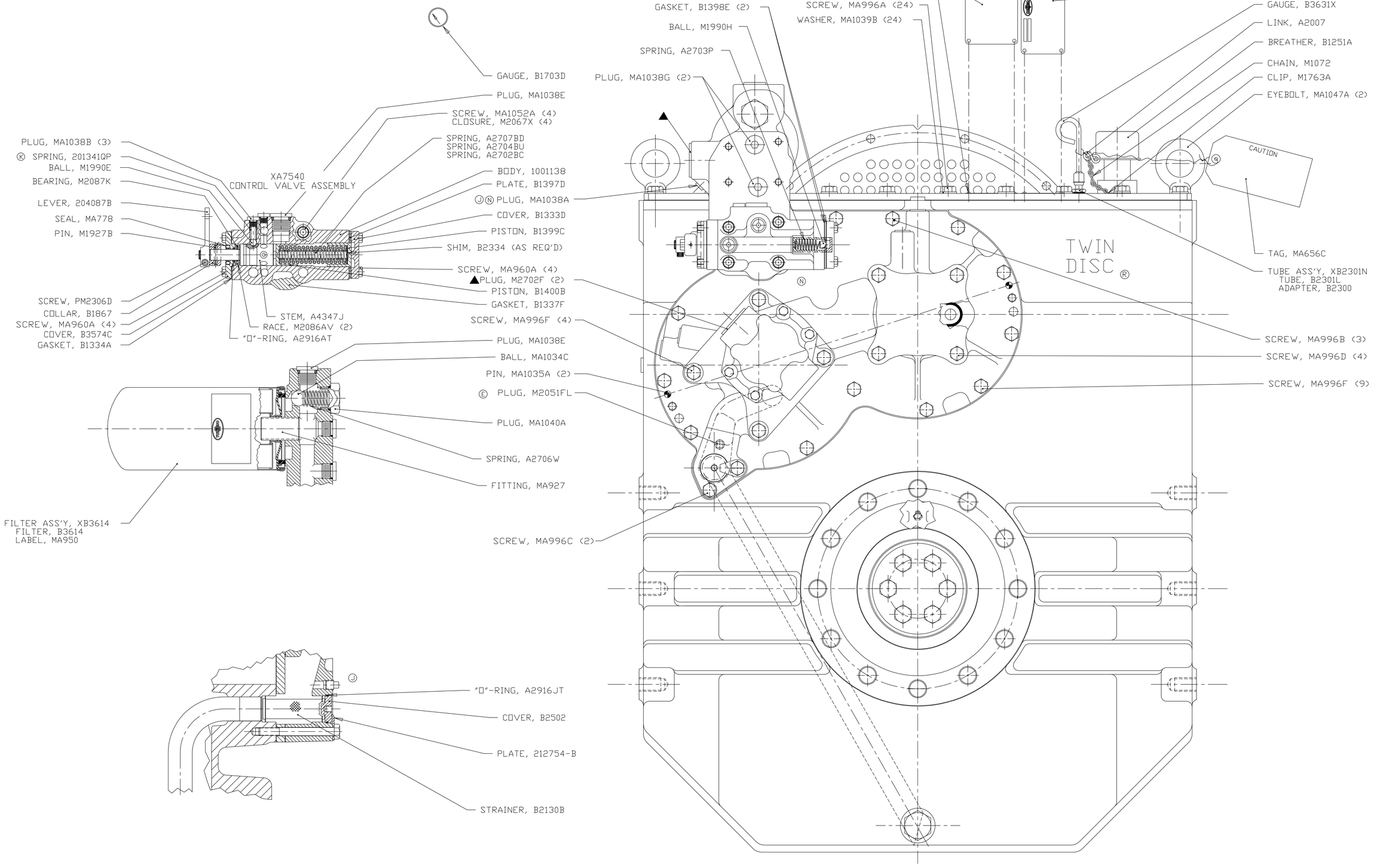
| | |
|---|---|
| MATERIAL | |
| HEAT TREAT | |
| SURFACE TREATMENT | |
| WEIGHT | 1032 kg |
| FIRST USE | |
| ASSY. MODEL | |
| NAME | MG-5202DC MARINE TRANSMISSION |
| DATE | 12-2-97 |
| SCALE | .50=1.00 |
| DRN. | AZ |
| CHK. | DAS |
| APPD. | DAS |

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE m/m
MACHINED DIMENSIONS
X ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ANG GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

TWIN DISC INCORPORATED RACINE, WI 53403 - USA

1015207A

SHEET 1 OF 7 REV 0

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METRIC

THIRD ANGLE PROJECTION

SIMILAR TO

Ⓠ

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MATERIAL

HEAT TREAT

SURFACE TREATMENT

WEIGHT 1032 kg

$WR^2$ N $m^2$

FIRST USE

ASSY.

MODEL

NAME MG-5202DC MARINE TRANSMISSION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ANG
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE: 12-2-97

SCALE: .50=1.00

DRN. AZ

CHK. DAS

APPD. DAS

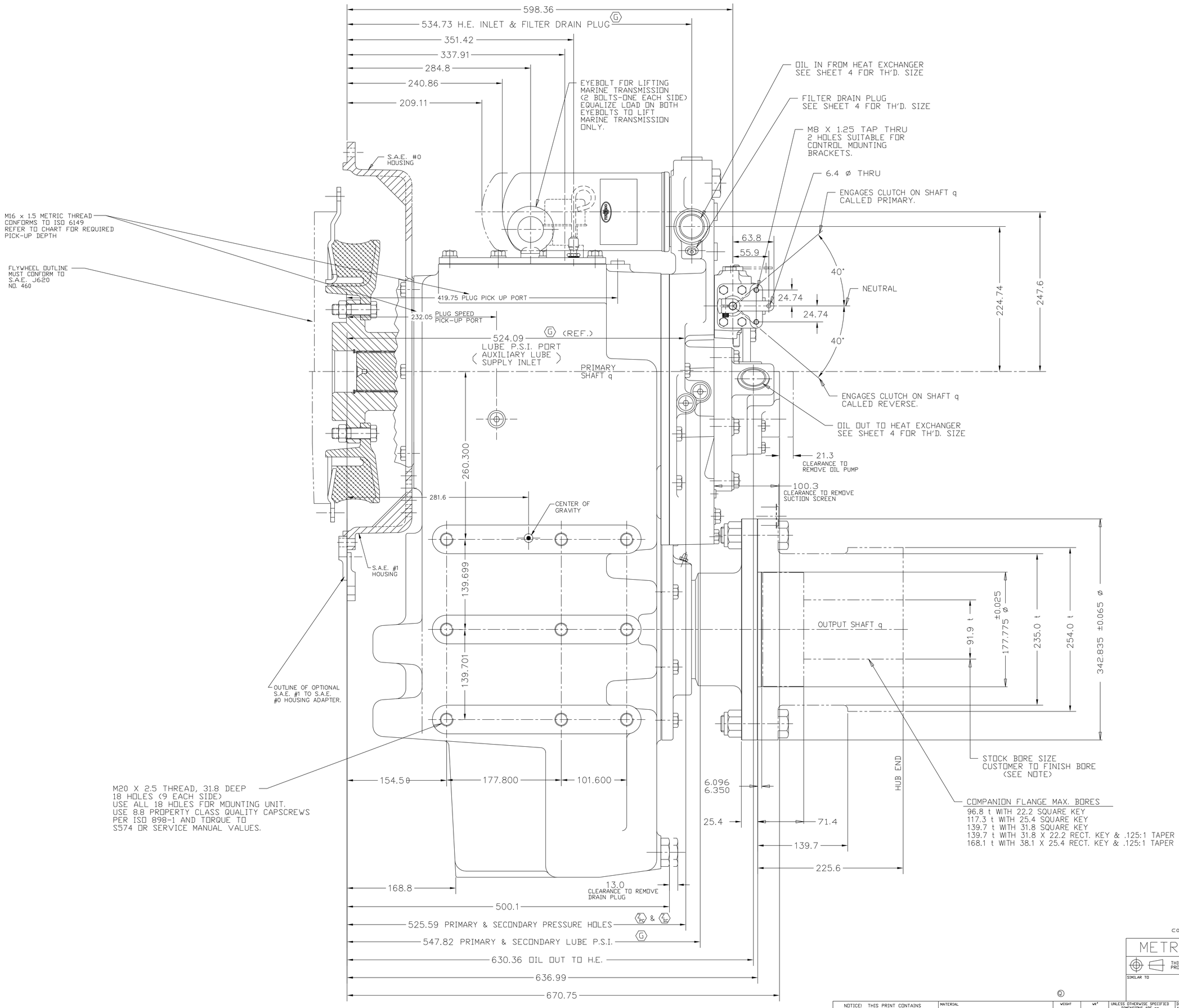
TWIN DISC INCORPORATED RACINE, WI 53403 - USA

1015207A

SHEET 2 OF 7 REV Q

E D C B A

6 5 4 3 2 1


598.36
534.73 H.E. INLET & FILTER DRAIN PLUG (G)
351.42
337.91
284.8
240.86
209.11
EYEBOLT FOR LIFTING MARINE TRANSMISSION (2 BOLTS-ONE EACH SIDE) EQUALIZE LOAD ON BOTH EYEBOLTS TO LIFT MARINE TRANSMISSION ONLY.
OIL IN FROM HEAT EXCHANGER SEE SHEET 4 FOR TH'D. SIZE
FILTER DRAIN PLUG SEE SHEET 4 FOR TH'D. SIZE
M8 X 1.25 TAP THRU 2 HOLES SUITABLE FOR CONTROL MOUNTING BRACKETS.
6.4 ø THRU
ENGAGES CLUTCH ON SHAFT q CALLED PRIMARY.
S.A.E. #0 HOUSING
M16 x 1.5 METRIC THREAD CONFORMS TO ISO 6149 REFER TO CHART FOR REQUIRED PICK-UP DEPTH
FLYWHEEL OUTLINE MUST CONFORM TO S.A.E. J620 NO. 460
63.8
55.9
40°
NEUTRAL
24.74
24.74
40°
224.74
247.6
419.75 PLUG PICK UP PORT
232.05 PLUG SPEED PICK-UP PORT
(G) (REF.)
524.09 LUBE P.S.I. PORT ( AUXILIARY LUBE SUPPLY INLET )
PRIMARY SHAFT q
ENGAGES CLUTCH ON SHAFT q CALLED REVERSE.
OIL OUT TO HEAT EXCHANGER SEE SHEET 4 FOR TH'D. SIZE
21.3
CLEARANCE TO REMOVE OIL PUMP
100.3
CLEARANCE TO REMOVE SUCTION SCREEN
260.300
281.6
CENTER OF GRAVITY
S.A.E. #1 HOUSING
139.699
139.701
OUTPUT SHAFT q
91.9 t
177.775 ±0.025 ø
235.0 t
254.0 t
342.835 ±0.065 ø
OUTLINE OF OPTIONAL S.A.E. #1 TO S.A.E. #0 HOUSING ADAPTER.
STOCK BORE SIZE CUSTOMER TO FINISH BORE (SEE NOTE)
M20 X 2.5 THREAD, 31.8 DEEP 18 HOLES (9 EACH SIDE) USE ALL 18 HOLES FOR MOUNTING UNIT. USE 8.8 PROPERTY CLASS QUALITY CAPSCREWS PER ISO 898-1 AND TORQUE TO S574 OR SERVICE MANUAL VALUES.
154.50
177.800
101.600
6.096
6.350
HUB END
COMPANION FLANGE MAX. BORES
96.8 t WITH 22.2 SQUARE KEY
117.3 t WITH 25.4 SQUARE KEY
139.7 t WITH 31.8 SQUARE KEY
139.7 t WITH 31.8 X 22.2 RECT. KEY & .125:1 TAPER
168.1 t WITH 38.1 X 25.4 RECT. KEY & .125:1 TAPER
25.4
71.4
139.7
225.6
168.8
13.0 CLEARANCE TO REMOVE DRAIN PLUG
500.1
525.59 PRIMARY & SECONDARY PRESSURE HOLES
547.82 PRIMARY & SECONDARY LUBE P.S.I.
630.36 OIL OUT TO H.E.
636.99
670.75

cad file: 115207A3

METRIC

THIRD ANGLE PROJECTION

SIMILAR TO

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| | | | |
|---|---|---|---|
| MATERIAL | WEIGHT 1032 kg | $WR^2$ N m² | UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm. MACHINED DIMENSIONS X ±0.75, X.X ±0.25, X.XX ±0.13. ALL ANGULAR TOLERANCES ANG GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982 |
| HEAT TREAT | FIRST USE ASSY. MODEL | | |
| SURFACE TREATMENT | NAME MG-5202DC MARINE TRANSMISSION | | |

| | |
|---|---|
| DATE | 12-2-97 |
| SCALE | .50=1.00 |
| DRN. | AZ |
| CHK. | DAS |
| APPD. | DAS |

TWIN DISC INCORPORATED RACINE, WI 53403 - USA

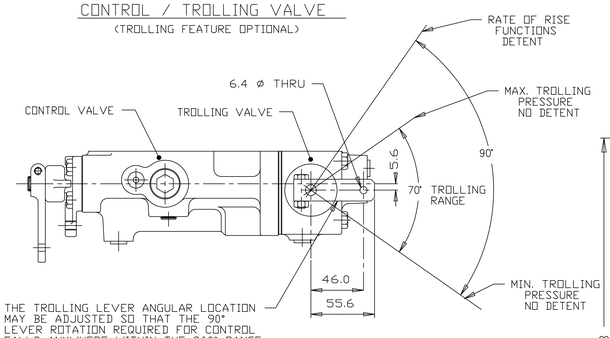
1015207A

SHEET 3 OF 7 REV 0

E D C B A

6 5 4 3 2 1

## CONTROL / TROLLING VALVE
(TROLLING FEATURE OPTIONAL)




THE TROLLING LEVER ANGULAR LOCATION MAY BE ADJUSTED SO THAT THE 90° LEVER ROTATION REQUIRED FOR CONTROL FALLS ANYWHERE WITHIN THE 360° RANGE IN WHICH THE LEVER MAY BE LOCATED.

### (OPTIONAL) TROLLING VALVE INSTALLATION AND OPERATING NOTES:

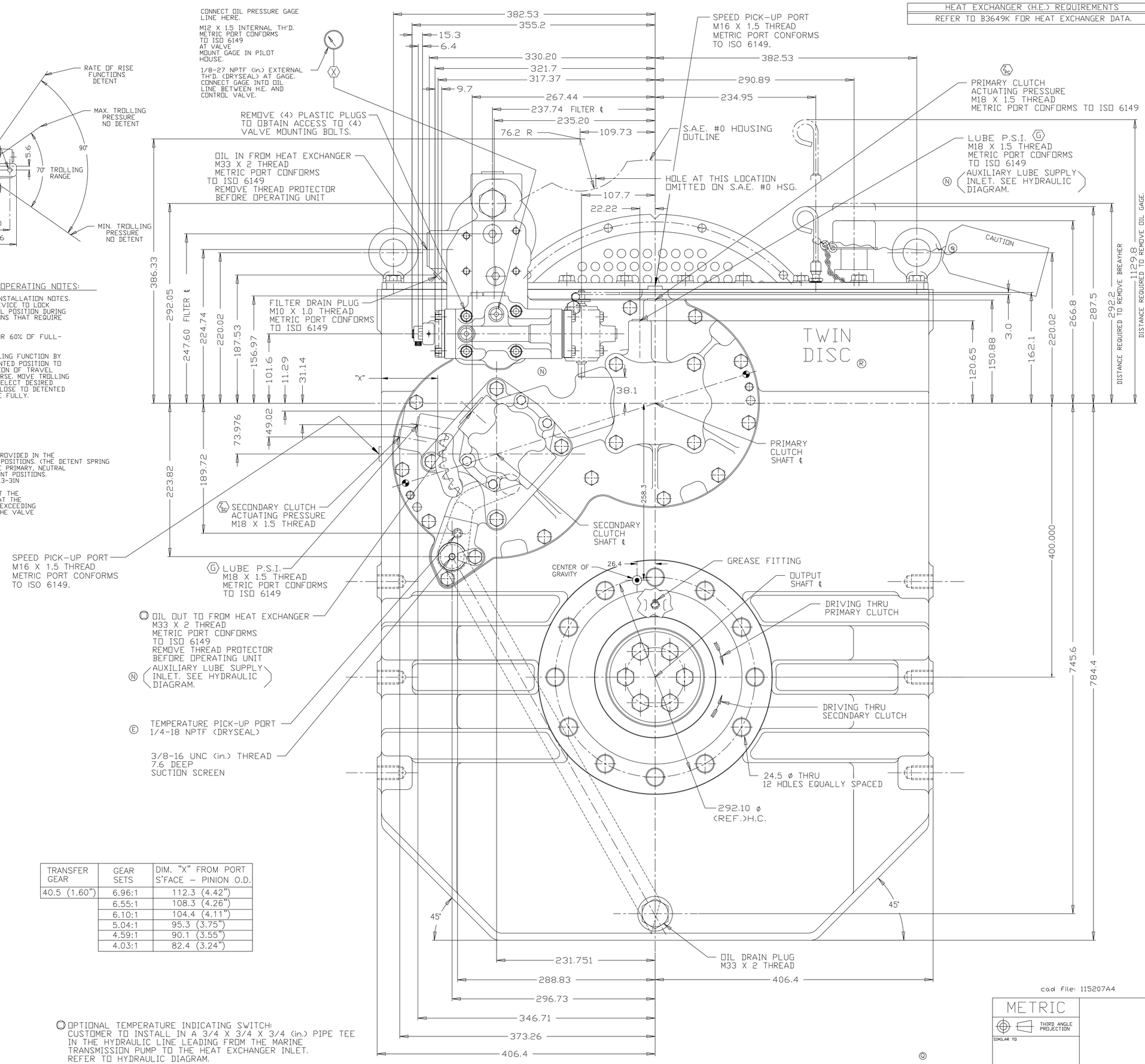
1.) REFER TO VALVE ASSEMBLY DRAWING FOR ADDITIONAL INSTALLATION NOTES. CONTROL HEAD FOR TROLLING VALVE MUST INCLUDE A DEVICE TO LOCK TROLLING VALVE CONTROL LEVER IN DETENTED NO-TROLL POSITION DURING MANEUVERING, DOCKING AND OTHER OPERATING CONDITIONS THAT REQUIRE FULL POWER TO THE PROPELLER.

2.) MAXIMUM ENGINE SPEED WHILE TROLLING, 1100 R.P.M. OR 60% OF FULL-LOAD ENGINE SPEED, WHICHEVER IS SMALLER.

3.) WITH CONTROL VALVE LEVER IN NEUTRAL, SELECT TROLLING FUNCTION BY MOVING TROLLING CONTROL LEVER OUT OF LOCKED DETENTED POSITION TO MAXIMUM TROLLING POSITION. SELECT TROLLING DIRECTION OF TRAVEL BY MOVING CONTROL VALVE LEVER TO FORWARD OR REVERSE. MOVE TROLLING CONTROL LEVER FROM MINIMUM TROLLING POSITION TO SELECT DESIRED TROLLING SPEED. WHEN TROLLING LEVER IS ADVANCED CLOSE TO DETENTED NO-TROLL POSITION, THE TROLLING CLUTCH MAY ENGAGE FULLY.

CONTROL VALVE:
Ⓚ 18-62 N AT THE 56.0 R LOCATION OF THE 6.35 ø HOLE IS REQUIRED TO OVERCOME DETENT EFFORT. THE DETENT FEATURE IS PROVIDED IN THE FULL PRIMARY CLUTCH, FULL SECONDARY CLUTCH AND NEUTRAL LEVER POSITIONS. (THE DETENT SPRING AND PIN MAY BE OMITTED WHEN REMOTE CONTROL SYSTEMS PROVIDE THE PRIMARY, NEUTRAL AND SECONDARY DETENTS THAT CORRESPOND EXACTLY WITH VALVE DETENT POSITIONS. FORCE AT THE LEVER HOLE TO OPERATE THE VALVE THEN REDUCES TO 13-31N THE REMOTE CONTROL VALVE ACTUATOR MUST PROVIDE ±35.8 LINEAR TRAVEL FROM NEUTRAL AT THE 6.35 ø HOLE LOCATION. ROTATIONAL STOPS AT THE STATED VALVE TRAVEL LIMITS HAVE A MAXIMUM CAPACITY OF 445 N AT THE 6.35 ø HOLE LOCATION. VALVE ACTUATORS WITH FORCE CAPABILITY EXCEEDING THIS LIMIT MUST HAVE SEPARATE STOPPING DEVICES SO CAPACITY OF THE VALVE ROTATIONAL STOPS IS NOT EXCEEDED. EXCEEDING THE CAPACITY OF THE VALVE ROTATIONAL STOPS CAN CAUSE LOSS OF CONTROL.

| HEAT EXCHANGER (H.E.) REQUIREMENTS |
|---|
| REFER TO B3649K FOR HEAT EXCHANGER DATA. |




| TRANSFER GEAR | GEAR SETS | DIM. "X" FROM PORT S'FACE – PINION O.D. |
|---|---|---|
| 40.5 (1.60") | 6.96:1 | 112.3 (4.42") |
| | 6.55:1 | 108.3 (4.26") |
| | 6.10:1 | 104.4 (4.11") |
| | 5.04:1 | 95.3 (3.75") |
| | 4.59:1 | 90.1 (3.55") |
| | 4.03:1 | 82.4 (3.24") |

Ⓞ OPTIONAL TEMPERATURE INDICATING SWITCH: CUSTOMER TO INSTALL IN A 3/4 X 3/4 X 3/4 (in.) PIPE TEE IN THE HYDRAULIC LINE LEADING FROM THE MARINE TRANSMISSION PUMP TO THE HEAT EXCHANGER INLET. REFER TO HYDRAULIC DIAGRAM.

NOTE:
ALL POINTS AVAILABLE FOR TESTING ARE CODED ⬡.

cad file: 115207A4

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

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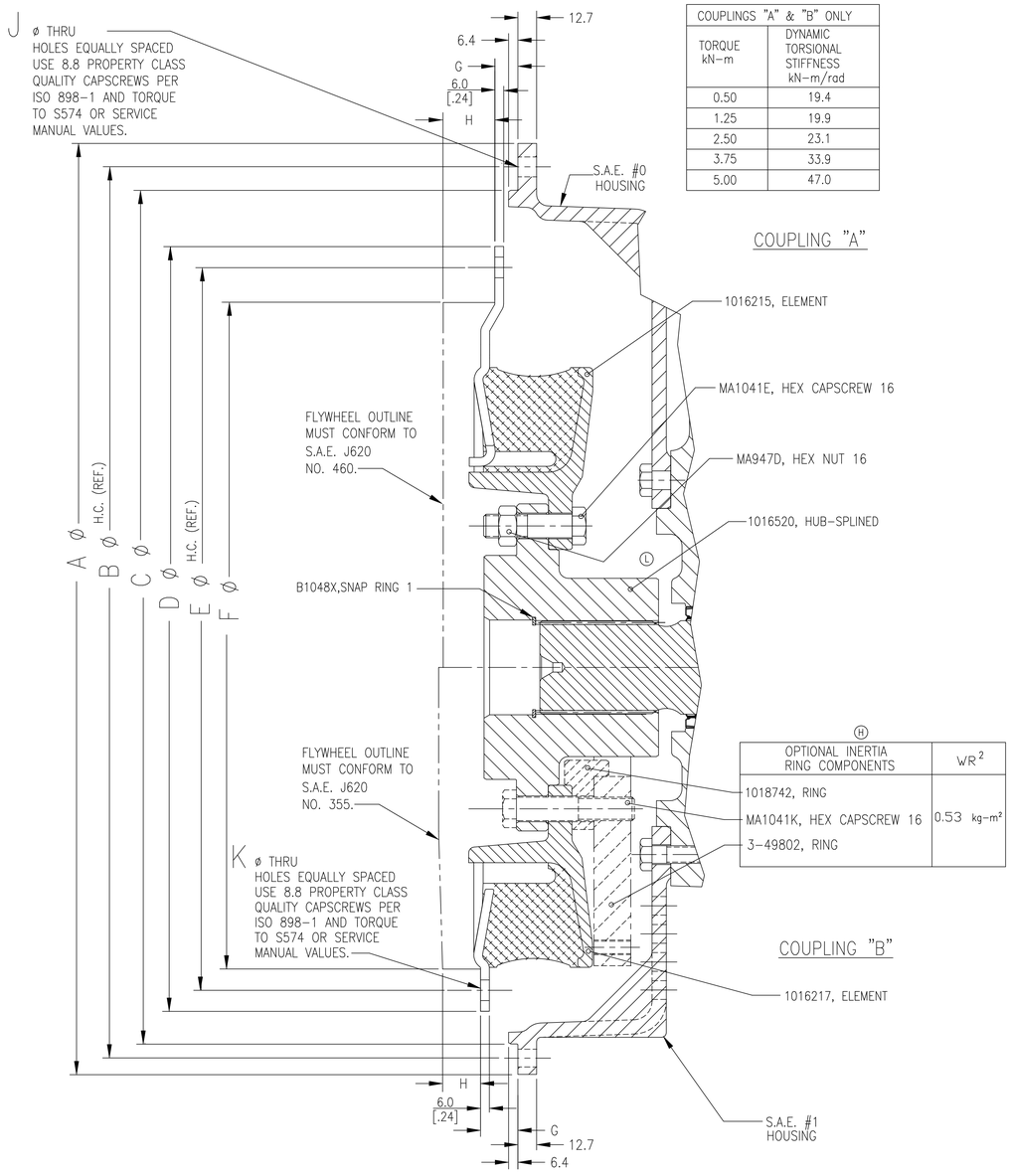
| | |
|---|---|
| MATERIAL | |
| HEAT TREAT | |
| SURFACE TREATMENT | |
| WEIGHT | 1032 kg |
| FIRST USE | |
| ASSY. | |
| MODEL | |
| NAME | MG-5202DC MARINE TRANSMISSION |
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm. MACHINED DIMENSIONS X ±0.75, X.X ±0.25, X.XX ±0.13. ALL ANGULAR TOLERANCES ANSI GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982 | |
| DATE | 12-2-97 |
| SCALE | .50=1.00 |
| DRN. | AZ |
| CHK. | DAS |
| APP'D. | DAS |

TWIN DISC INCORPORATED RACINE, WI 53403 - USA

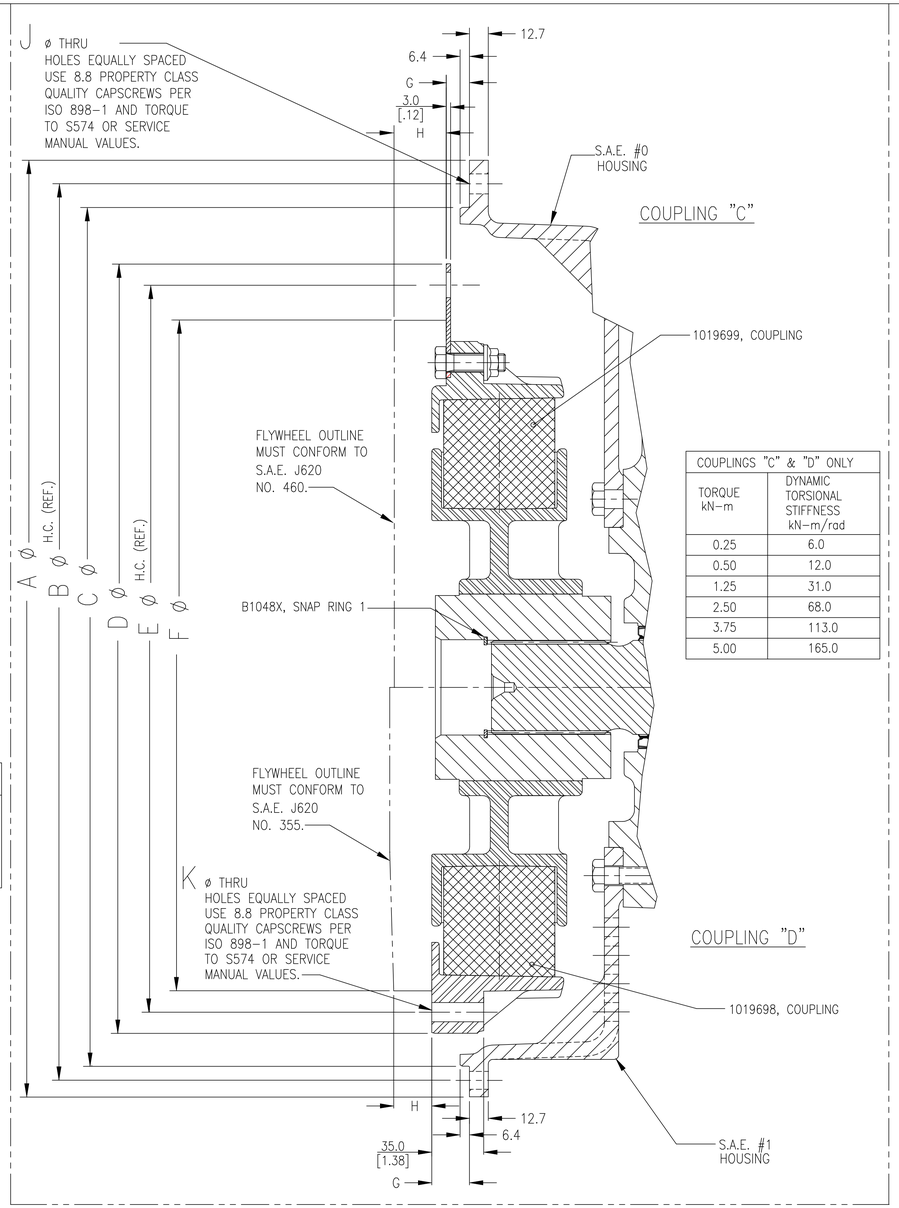
10115207A

SHEET 4 OF 7 REV Q

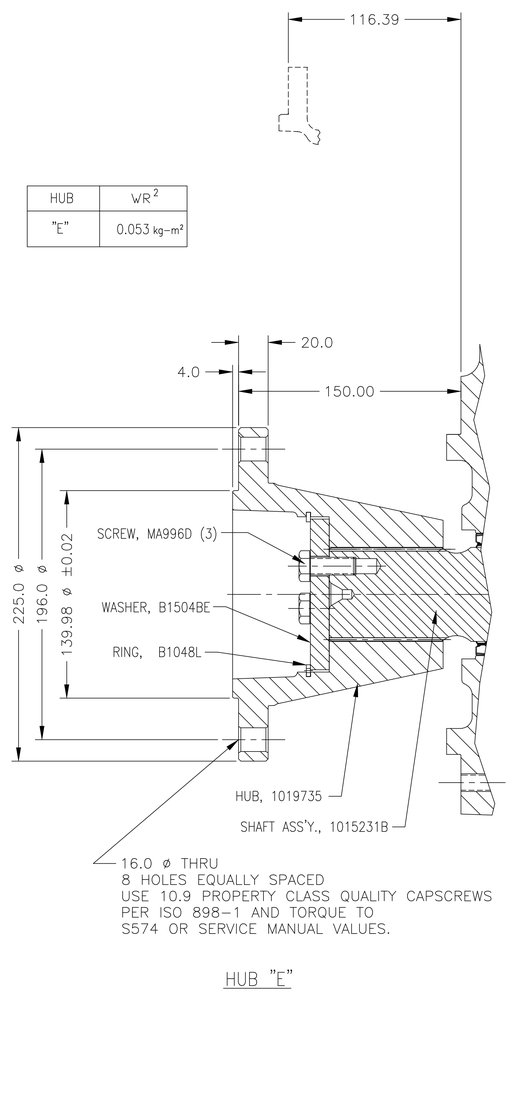



| COUPLINGS "A" & "B" ONLY | |
|---|---|
| TORQUE kN-m | DYNAMIC TORSIONAL STIFFNESS kN-m/rad |
| 0.50 | 19.4 |
| 1.25 | 19.9 |
| 2.50 | 23.1 |
| 3.75 | 33.9 |
| 5.00 | 47.0 |

| Ⓗ OPTIONAL INERTIA RING COMPONENTS | $WR^2$ |
|---|---|
| 1018742, RING<br>MA1041K, HEX CAPSCREW 16<br>3-49802, RING | 0.53 kg-m² |




| COUPLINGS "C" & "D" ONLY | |
|---|---|
| TORQUE kN-m | DYNAMIC TORSIONAL STIFFNESS kN-m/rad |
| 0.25 | 6.0 |
| 0.50 | 12.0 |
| 1.25 | 31.0 |
| 2.50 | 68.0 |
| 3.75 | 113.0 |
| 5.00 | 165.0 |




| HUB | $WR^2$ |
|---|---|
| "E" | 0.053 kg-m² |

| COUPLING | SAE J620 FLYWHEEL SIZE | COUPLING NO. | MAX. COUPLING rpm* | NOMINAL TORQUE kN-m | DYNAMIC TORSIONAL STIFFNESS | COUPLING $WR^2$ kg-m² OUTER PARTS | COUPLING $WR^2$ kg-m² INNER PARTS** |
|---|---|---|---|---|---|---|---|
| A | NO. 460 | VKE 4911S -4000/18 | 2750 | 5.00 | PER CHART | 0.61 | 0.41 |
| B | NO. 355 | VKE 4911S -4000/14 | 2750 | 5.00 | PER CHART | 0.24 | 0.41 |
| C | NO. 460 | CF-R-308-018 -6001A-HR | 2800 | 5.00 | PER CHART | 0.290 | 0.166 |
| D | NO. 355 | CF-R-308-014 -6001B-HR | 3000 | 5.00 | PER CHART | 0.206 | 0.166 |

Ⓗ

| SAE NO | S.A.E. J620 MARINE TRANSMISSION FLYWHEEL NO. | A | B | C +0.000 -0.127 | D +0.00 -0.13 | E | F | G | H | J | K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 460 | 711.2 | 679.45 | 647.70 | 571.5 | 542.9 | 494 | 15.7 | 35.0 | 16 OF 13.5 | 6 OF 17 |
| 1 | 355 | 552.4 | 530.20 | 511.17 | 467.7 | 438.15 | 406 | 25.4 | 25.7 | 12 OF 11.9 | 8 OF 14 |

* SEE SHEET 1 FOR MAXIMUM TRANSMISSION R.P.M.
** THE $WR^2$ OF INNER PARTS INCLUDES HUB AND 1/4 SHAFT $C^2$.

ALL COUPLINGS ABOVE HAVE TORSIONAL STOP INCLUDED.

△ FOR TRANSMISSION SHIPMENT: SECURE FLEXIBLE COUPLING TO HOUSING S.A.E FLANGE HOLES, USING STANDARD METHOD, BEFORE SHIPMENT OF UNIT.

FOR TRANSMISSION/COUPLING ASSEMBLY TO ENGINE:
INSTALL COUPLING AND HUB TO ENGINE FLYWHEEL.
ADVANCE MARINE TRANSMISSION INTO POSITION WITH ENGINE FLYWHEEL HOUSING MOUNTING FLANGE. LINE UP INPUT SHAFT EXTERNAL SPLINE WITH INTERNAL SPLINE IN COUPLING HUB AND MOVE ENGINE AND MARINE TRANSMISSION TOGETHER MAINTAINING ENGINE FLYWHEEL HOUSING AND MARINE TRANSMISSION FLYWHEEL HOUSING MOUNTING FACES IN PARALLEL RELATIONSHIP. ENGAGE FLYWHEEL HOUSING PILOTS AND INSTALL ALL MOUNTING CAPSCREWS USING 8.8 PROPERTY CLASS QUALITY PER ISO 898-1 [GRADE 5 QUALITY CAPSCREWS PER S.A.E. J429] TORQUED TO S574 OR SERVICE MANUAL VALUES.

Ⓠ

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

NOTICE! THIS PRINT CONTAINS PROPRIETARY INFORMATION AND IS NOT TO BE USED IN ANY MANNER DETRIMENTAL TO THE INTERESTS OF TWIN DISC, INCORPORATED RACINE, WI 53403 - USA THIS NOTICE IS NOT INTENDED TO NULLIFY OR LIMIT RIGHTS GRANTED TO THE U.S. GOVERMENT OR OTHERS BY CONTRACT.

MATERIAL
HEAT TREAT
SURFACE TREATMENT
WEIGHT 1032 kg
$WR^2$ N m²
FIRST USE
ASSY.
MODEL
NAME MG-5202DC MARINE TRANSMISSION (FLEXIBLE COUPLING INPUTS)
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X. ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ANG GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982
DATE 12-2-97
SCALE .50=1.00
DRN. AZ
CHK. DAS
APP'D. DAS

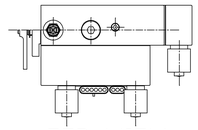
TWIN DISC INCORPORATED
RACINE, WI 53403 - USA

1015207A

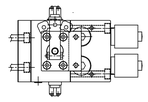
SHEET 5 OF 7 REV Q

F E C B A

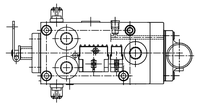
DETAILS OF 1018085 -
CONTROL VALVE ASS'Y
W/ TROLLING VALVE



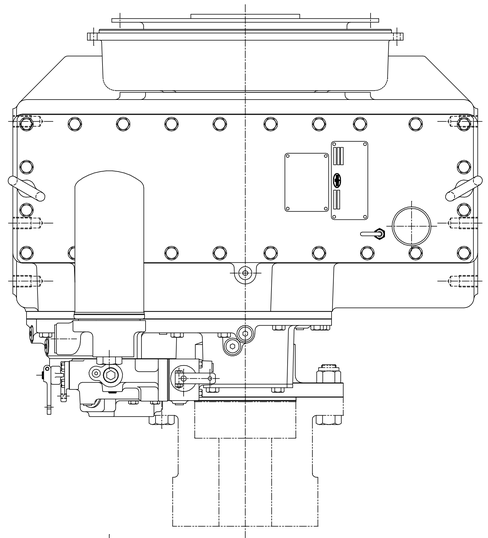
TOP VIEW

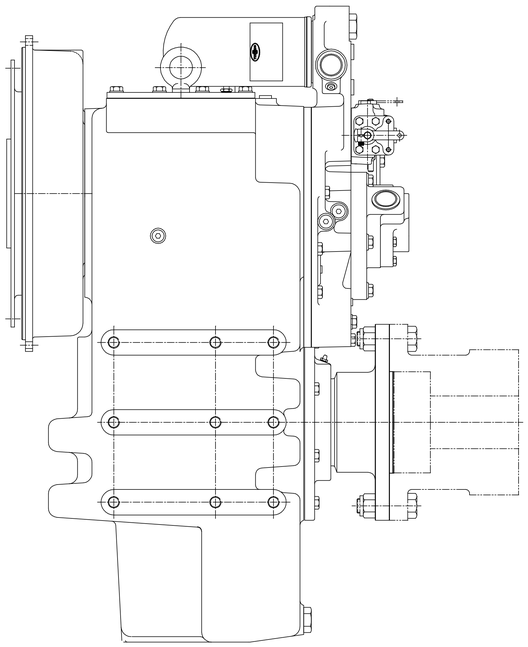


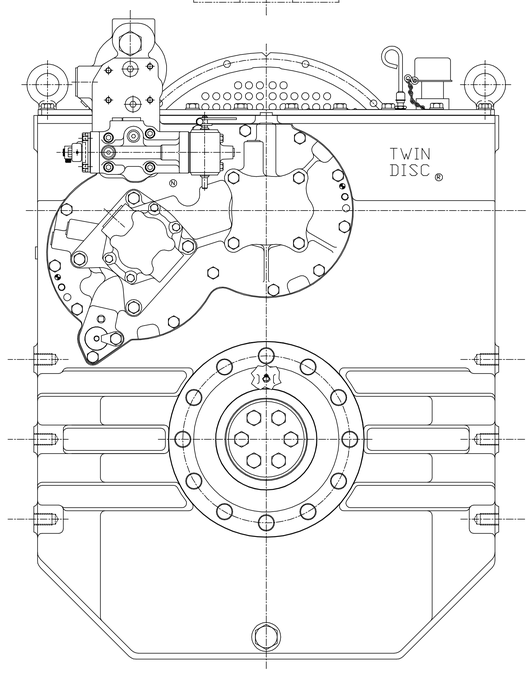
END VIEW

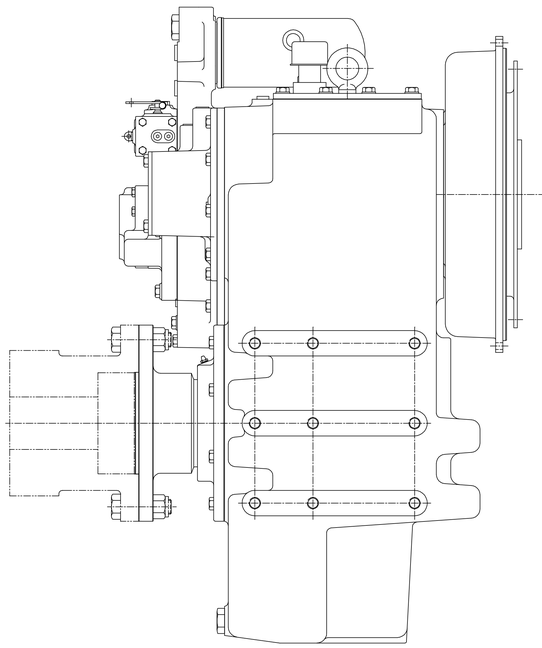


SIDE VIEW







S.A.E. #1 HOUSING

cad file: 115207A6

METRIC

THIRD ANGLE PROJECTION

SIMILAR TO

NOTICE! THIS PRINT CONTAINS PROPRIETARY INFORMATION AND IS NOT TO BE USED IN ANY MANNER DETRIMENTAL TO THE INTERESTS OF
TWIN DISC, INCORPORATED
RACINE, WI 53403 - USA
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MATERIAL

HEAT TREAT

SURFACE TREATMENT

WEIGHT 1032 kg

VR' N m

FIRST USE

ASSY.

MODEL

NAME MG-5202DC
MARINE TRANSMISSION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE mm
MACHINED DIMENSIONS
X ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING
PER ANSI Y14.5M 1982

DATE 12-2-97
SCALE 25=1.00
DRN. AZ
CHK. DAS
APPD. DAS

TWIN DISC INCORPORATED
RACINE, WI 53403 - USA

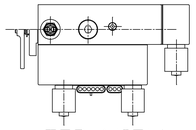
1015207A

SHEET 6 OF 7 REV 0

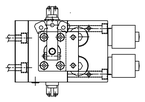
E D C B A

6 5 4 3 2 1

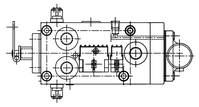
DETAILS OF 1018085 -
CONTROL VALVE ASS'Y
W/ TROLLING VALVE



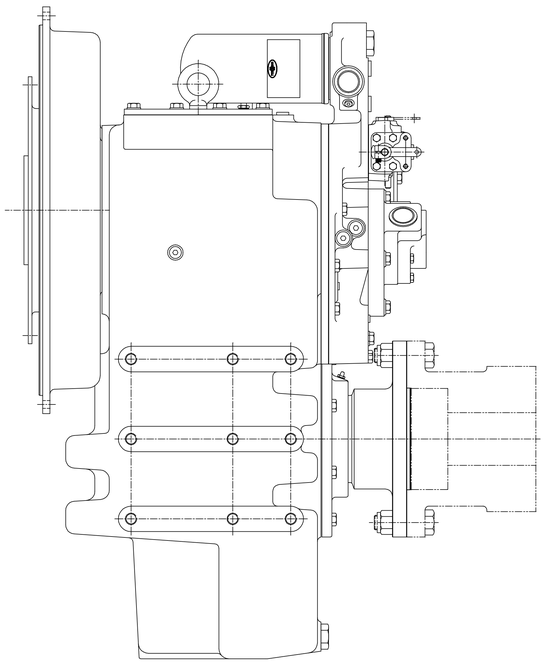
TOP VIEW

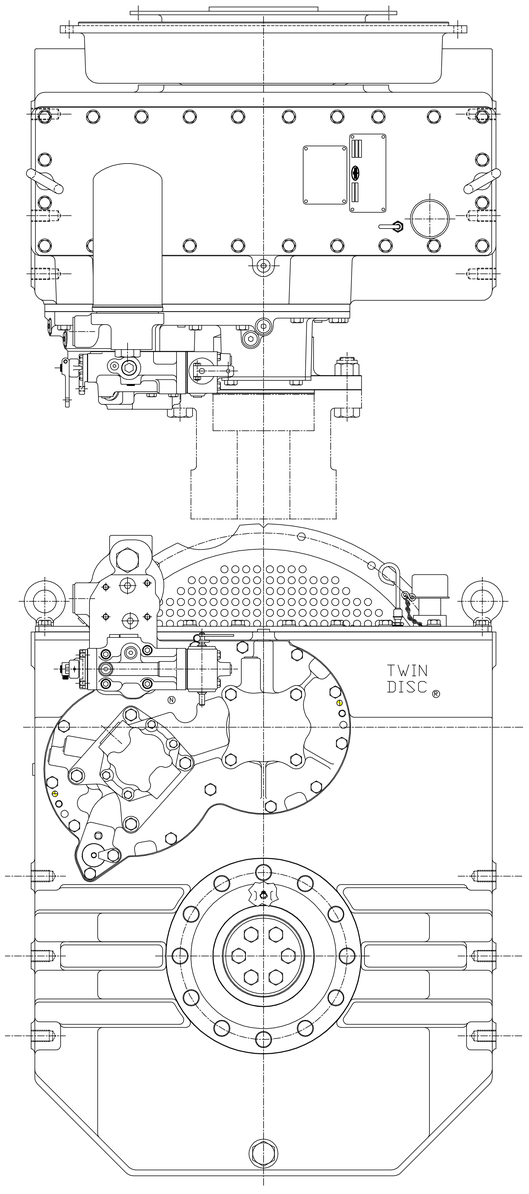


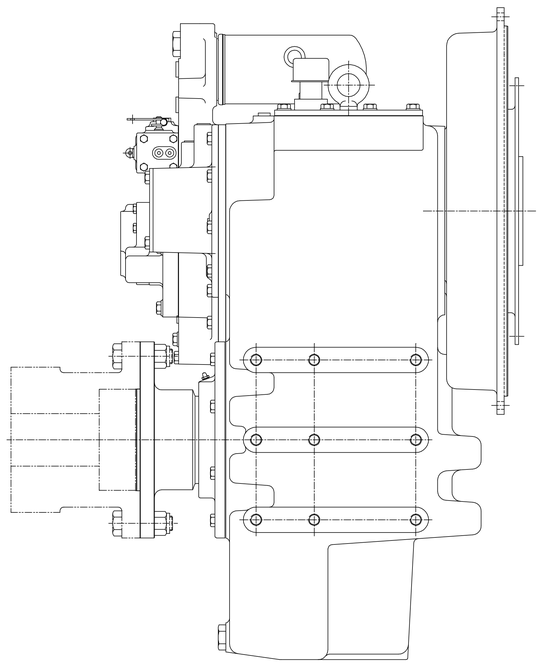
END VIEW



SIDE VIEW





S.A.E. #0 HOUSING

cad file: 115207A7

METRIC

THIRD ANGLE PROJECTION

SIMILAR TO

Q

NOTICE! THIS PRINT CONTAINS PROPRIETARY INFORMATION AND IS NOT TO BE USED IN ANY MANNER DETRIMENTAL TO THE INTERESTS OF TWIN DISC, INCORPORATED RACINE, WI 53403 - USA
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MATERIAL

HEAT TREAT

SURFACE TREATMENT

WEIGHT 1032 kg | V8* N.A.*

FIRST USE

ASSY. MODEL

NAME MG-5202DC MARINE TRANSMISSION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 12-2-97
SCALE .25=1.00
DRN. AZ
CHK. DAS
APPD. DAS

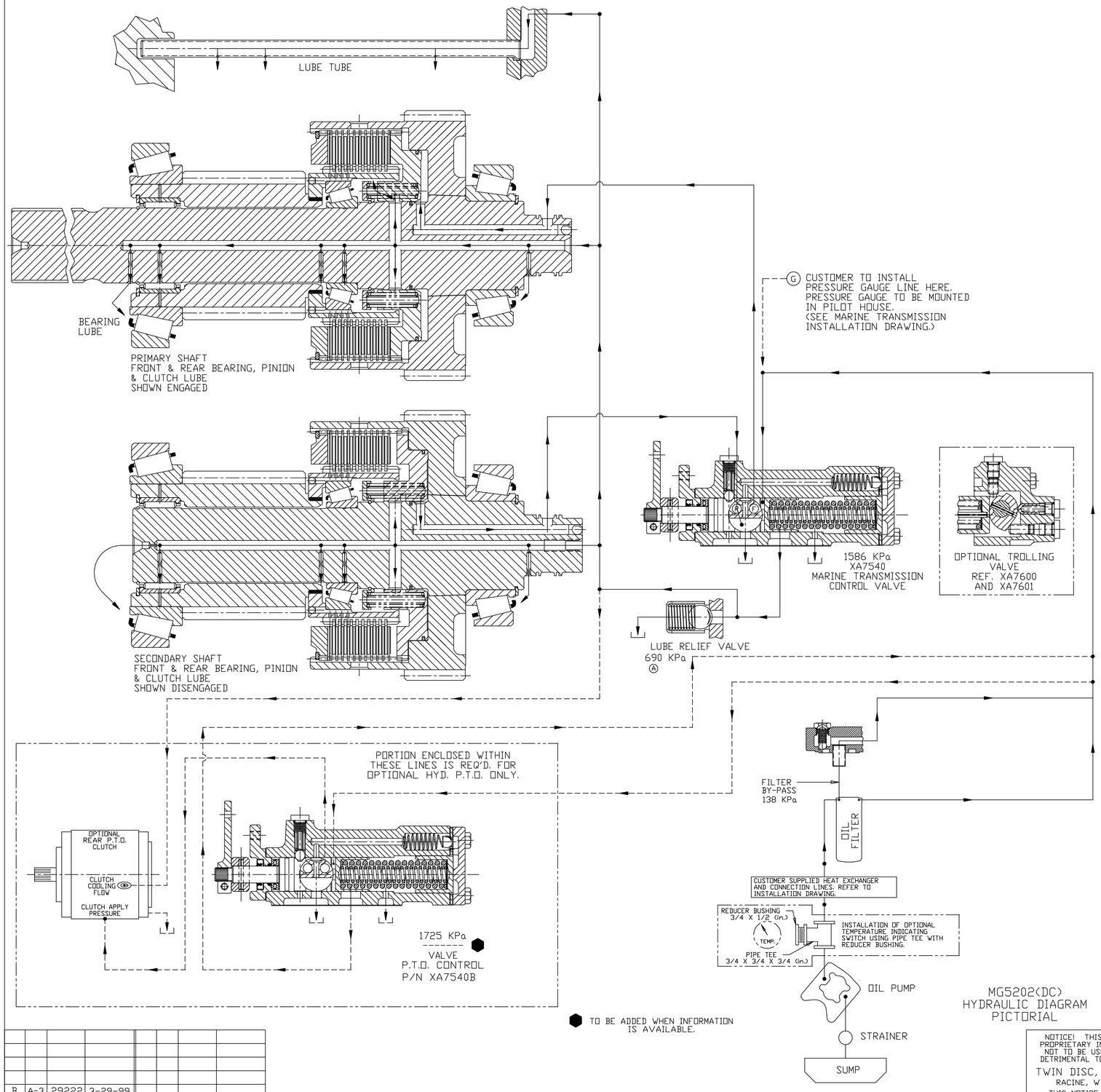
TWIN DISC INCORPORATED
RACINE, WI 53403 - USA

1015207A

SHEET 7 OF 7 REV Q

E D C B A

6 5 4 3 2 1


LUBE TUBE
BEARING LUBE
PRIMARY SHAFT FRONT & REAR BEARING, PINION & CLUTCH LUBE SHOWN ENGAGED
SECONDARY SHAFT FRONT & REAR BEARING, PINION & CLUTCH LUBE SHOWN DISENGAGED
(G) CUSTOMER TO INSTALL PRESSURE GAUGE LINE HERE. PRESSURE GAUGE TO BE MOUNTED IN PILOT HOUSE. (SEE MARINE TRANSMISSION INSTALLATION DRAWING.)
1586 KPa XA7540 MARINE TRANSMISSION CONTROL VALVE
OPTIONAL TROLLING VALVE REF. XA7600 AND XA7601
LUBE RELIEF VALVE 690 KPa (A)
PORTION ENCLOSED WITHIN THESE LINES IS REQ'D. FOR OPTIONAL HYD. P.T.O. ONLY.
OPTIONAL REAR P.T.O. CLUTCH
CLUTCH COOLING FLOW
CLUTCH APPLY PRESSURE
1725 KPa
VALVE P.T.O. CONTROL P/N XA7540B
FILTER BY-PASS 138 KPa
OIL FILTER
CUSTOMER SUPPLIED HEAT EXCHANGER AND CONNECTION LINES. REFER TO INSTALLATION DRAWING.
REDUCER BUSHING 3/4 X 1/2 (in.)
TEMP.
INSTALLATION OF OPTIONAL TEMPERATURE INDICATING SWITCH USING PIPE TEE WITH REDUCER BUSHING.
PIPE TEE 3/4 X 3/4 X 3/4 (in.)
OIL PUMP
STRAINER
SUMP
TO BE ADDED WHEN INFORMATION IS AVAILABLE.
PRIMARY CLUTCH
SECONDARY CLUTCH
SPRING RELEASED CLUTCHES
CLUTCH
(LUBE TUBE)
RED. GEAR LUBE
RED. GEAR LUBE
TRANSFER GEAR LUBE
PRIMARY & SECONDARY SHAFT LUBE
FRONT PINION BRG.
FRONT SHAFT BEARING
REAR PINION BEARING
REAR PINION BEARING
CLUTCH
REAR SHAFT BEARING
LUBE RELIEF VALVE 690 KPa (A)
MAN.
F N R
(G) CUSTOMER TO INSTALL PRESSURE GAUGE AND LINE HERE.
APPROX. 1586 KPa
XA7540 MARINE TRANSMISSION CONTROL VALVE SHOWN IN NEUTRAL
HYD.
MAN.
OPTIONAL TROLLING VALVE REF. XA7600
OPTIONAL AUXILIARY LUBE SYSTEM (USER TO SUPPLY COMPONENTS AND TO INSTALL)
LUBE HOSES TO MEET REQUIREMENTS OF SAE J517 FOR 100R1 HOSE; SELF EXTINGUISHING AND FIRE RESISTANT REQUIREMENTS, ALSO IDENTIFICATION REQUIRED BY THE U.S. COAST GUARD, AS SPECIFIED IN CODE OF FEDERAL REGULATIONS 46 CFR 56.60-25(c).
PORTION ENCLOSED WITHIN THESE LINES IS REQ'D. FOR OPTIONAL HYD. P.T.O. ONLY.
"B"
P.T.O. LUBE & COOLING
P.T.O. CLUTCH
V2 IS NOT REQ'D. W/O P.T.O. THIS LINE ("A"-"B") REPLACES IT.
(B) REMOVE MA1038D, M18 X 1.5 PLUG FROM MANIFOLD PER MARINE TRANSMISSION INSTALLATION DRAWING AND INSTALL LUBE LINE TO DIRECT LUBE FLOW INTO TRANSMISSION HYDRAULIC CIRCUIT.
MAN.
ENG. DIS. (SHOWN)
APPROX. 1724 KPa
V2 VALVE P.T.O. CONTROL
HYD.
CUSTOMER SUPPLIED HEAT EXCHANGER AND CONNECTION LINES. REFER TO INSTALLATION DRAWING.
FILTER BY-PASS 138 KPa
TEMP.
CHECK VALVE
15.8 DIA. MIN. I.D. HOSE
25 MICRON FULL FLOW FILTER
PUMP
FILTER
ELECTRIC MOTOR DRIVE PUMP 19-38 L/ min.
SCR
19.0 DIA. MIN. I.D. HOSE
STRAINER
"A"
INSTALLATION OF OPTIONAL TEMPERATURE INDICATING SWITCH USING PIPE TEE WITH REDUCER BUSHING.
MA1040B DRAIN PLUG LOCATION M33 X 2 THREAD PER MARINE TRANSMISSION INSTALLATION AND ASSEMBLY DRAWING.

MG5202(DC) HYDRAULIC DIAGRAM PICTORIAL

MG5202(DC) HYDRAULIC DIAGRAM GRAPHICAL J.I.C. SYMBOLS

THIRD ANGLE PROJECTION

SIMILAR TO

METRIC

| REV | ZONE | CH. NO. | DATE |
|---|---|---|---|
| B | A-3 | 29222 | 3-29-99 |
| A | D-3 | 29090 | 1-25-99 |

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MATERIAL

HEAT TREAT

SURFACE TREATMENT

WEIGHT kg | WR² N m²

FIRST USE 1015207
ASSY. MG-5202DC
MODEL

NAME DIAGRAM, HYDRAULIC

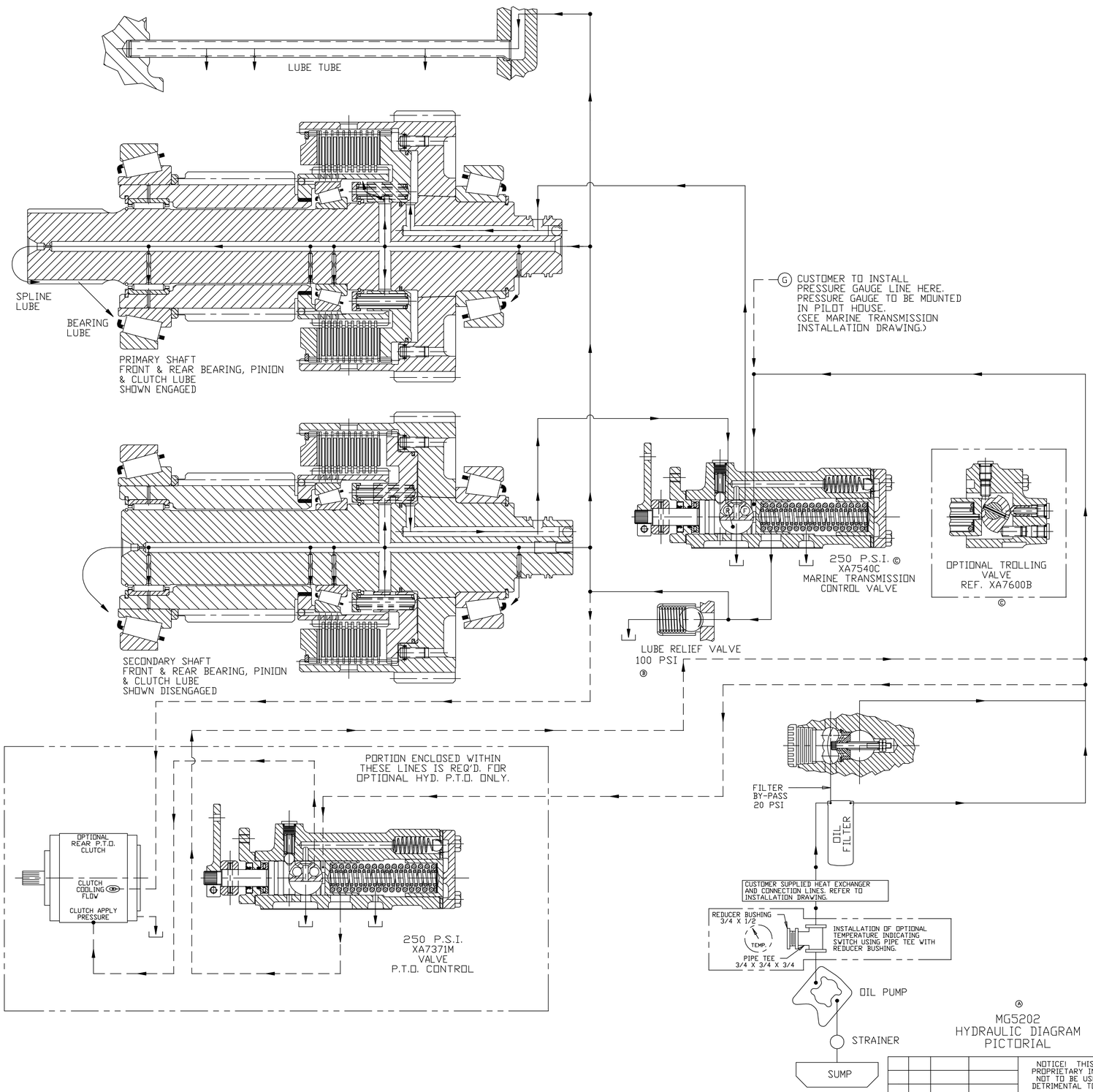
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X. ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 12-7-93
SCALE NONE
DRN. KS
CHK. DAS
APPD. TBC

TWIN DISC INCORPORATED RACINE, WI 53403 - USA

A7119R

SHEET 1 OF 1 REV B


LUBE TUBE
SPLINE LUBE
BEARING LUBE
PRIMARY SHAFT
FRONT & REAR BEARING, PINION
& CLUTCH LUBE
SHOWN ENGAGED
SECONDARY SHAFT
FRONT & REAR BEARING, PINION
& CLUTCH LUBE
SHOWN DISENGAGED
G CUSTOMER TO INSTALL PRESSURE GAUGE LINE HERE. PRESSURE GAUGE TO BE MOUNTED IN PILOT HOUSE. (SEE MARINE TRANSMISSION INSTALLATION DRAWING.)
250 P.S.I. © XA7540C MARINE TRANSMISSION CONTROL VALVE
OPTIONAL TROLLING VALVE REF. XA7600B ©
LUBE RELIEF VALVE 100 PSI Ⓑ
PORTION ENCLOSED WITHIN THESE LINES IS REQ'D. FOR OPTIONAL HYD. P.T.O. ONLY.
FILTER BY-PASS 20 PSI
OIL FILTER
CUSTOMER SUPPLIED HEAT EXCHANGER AND CONNECTION LINES. REFER TO INSTALLATION DRAWING.
REDUCER BUSHING 3/4 X 1/2
TEMP.
PIPE TEE 3/4 X 3/4 X 3/4
INSTALLATION OF OPTIONAL TEMPERATURE INDICATING SWITCH USING PIPE TEE WITH REDUCER BUSHING.
OIL PUMP
STRAINER
SUMP
OPTIONAL REAR P.T.O. CLUTCH
CLUTCH COOLING FLOW
CLUTCH APPLY PRESSURE
250 P.S.I. XA7371M VALVE P.T.O. CONTROL
Ⓐ MG5202 HYDRAULIC DIAGRAM PICTORIAL
PRIMARY CLUTCH
SECONDARY CLUTCH
SPRING RELEASED CLUTCHES
CLUTCH
(LUBE TUBE)
RED. GEAR LUBE
RED. GEAR LUBE
TRANSFER GEAR LUBE
PRIMARY & SECONDARY SHAFT LUBE
FRONT TAPERED BRG. (AND INPUT SPLINE)
FRONT PINION BEARING
REAR PINION BEARING
REAR PINION BEARING
CLUTCH
REAR SHAFT BEARING
LUBE RELIEF VALVE 100 PSI Ⓑ
MAN.
F N R
APPROX. 250 PSI ©
XA7371S MARINE TRANSMISSION CONTROL VALVE SHOWN IN NEUTRAL
G CUSTOMER TO INSTALL PRESSURE GAUGE AND LINE HERE.
HYD.
MAN.
OPTIONAL TROLLING VALVE REF. XA7600B ©
OPTIONAL AUXILIARY LUBE SYSTEM (USER TO SUPPLY COMPONENTS AND TO INSTALL)
LUBE HOSES TO MEET REQUIREMENTS OF SAE J517 FOR 100R1 HOSE; SELF EXTINGUISHING AND FIRE RESISTANT REQUIREMENTS, ALSO IDENTIFICATION REQUIRED BY THE U.S. COAST GUARD, AS SPECIFIED IN CODE OF FEDERAL REGULATIONS 46 CFR 56.60-25(C).
PORTION ENCLOSED WITHIN THESE LINES IS REQ'D. FOR OPTIONAL HYD. P.T.O. ONLY.
"B"
"A"
P.T.O. LUBE & COOLING
P.T.O. CLUTCH
V2 IS NOT REQ'D. W/O P.T.O. THIS LINE ("A"-"B") REPLACES IT.
MAN.
ENG. DIS. (SHOWN)
APPROX. 250 PSI
V2 XA7371M VALVE P.T.O. CONTROL
HYD.
CUSTOMER SUPPLIED HEAT EXCHANGER AND CONNECTION LINES. REFER TO INSTALLATION DRAWING.
FILTER BY-PASS 20 PSI
TEMP.
PUMP
FILTER
SCR
INSTALLATION OF OPTIONAL TEMPERATURE INDICATING SWITCH USING PIPE TEE WITH REDUCER BUSHING.
© REMOVE MA1038D, M18 x 1.5 PLUG FROM MANIFOLD PER MARINE TRANSMISSION INSTALLATION DRAWING AND INSTALL LUBE LINE TO DIRECT LUBE FLOW INTO TRANSMISSION HYDRAULIC CIRCUIT.
CHECK VALVE
5/8 DIA. MIN. I.D. HOSE
25 MICRON FULL FLOW FILTER
ELECTRIC MOTOR DRIVE PUMP 5-10 GPM
3/4 DIA. MIN. I.D. HOSE
STRAINER
© MA1040B DRAIN PLUG LOCATION M33 x 2.0 THREAD PER MARINE TRANSMISSION INSTALLATION AND ASSEMBLY DRAWING.
Ⓐ MG5202 HYDRAULIC DIAGRAM GRAPHICAL J.I.C. SYMBOLS
THIRD ANGLE PROJECTION
SIMILAR TO

| REV | ZONE | CH. NO. | DATE |
|---|---|---|---|
| C | D-3 | 29222 | 3-29-99 |
| B | D-3 | 29090 | 1-25-99 |
| A | B-3 | 25115 | 7-1-93 |

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MATERIAL

HEAT TREAT

SURFACE TREATMENT

WEIGHT LBS. | WR² LBS. IN²

FIRST USE
ASSY. 1014841
MODEL MG5202 Ⓐ

NAME DIAGRAM, HYDRAULIC

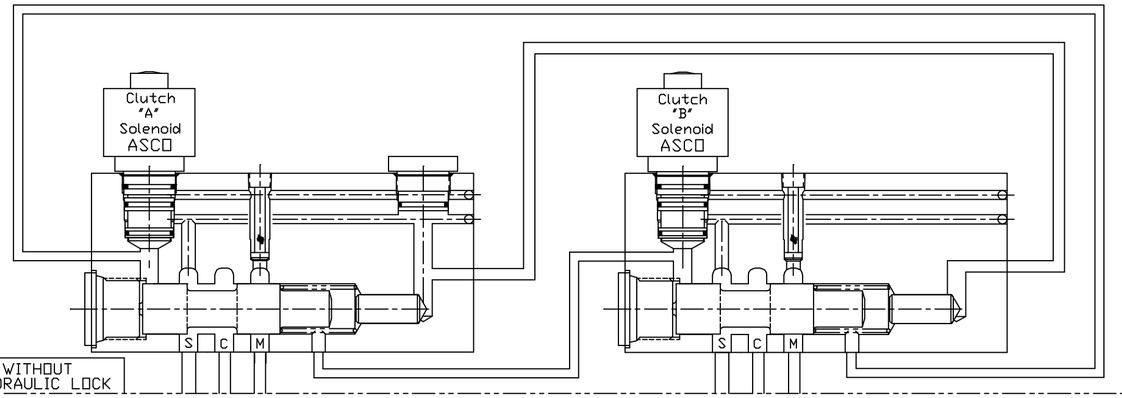
UNLESS OTHERWISE SPECIFIED
MACHINED DIMENSIONS
X.X ±0.030
X.XX ±0.010
X.XXX ±0.005
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 4-14-93
SCALE NONE
DRN. KS
CHK. JS
APPD. TBC

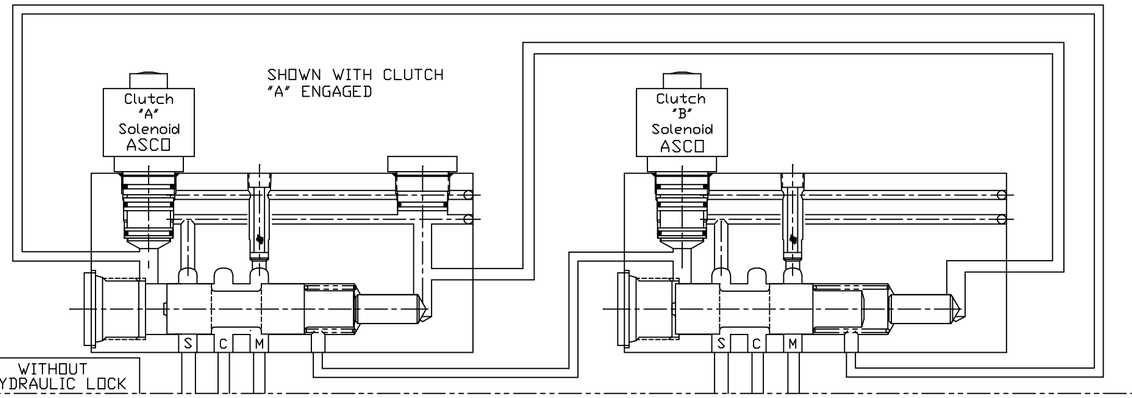
TWIN DISC INCORPORATED RACINE, WI 53403 - USA

A7119Q

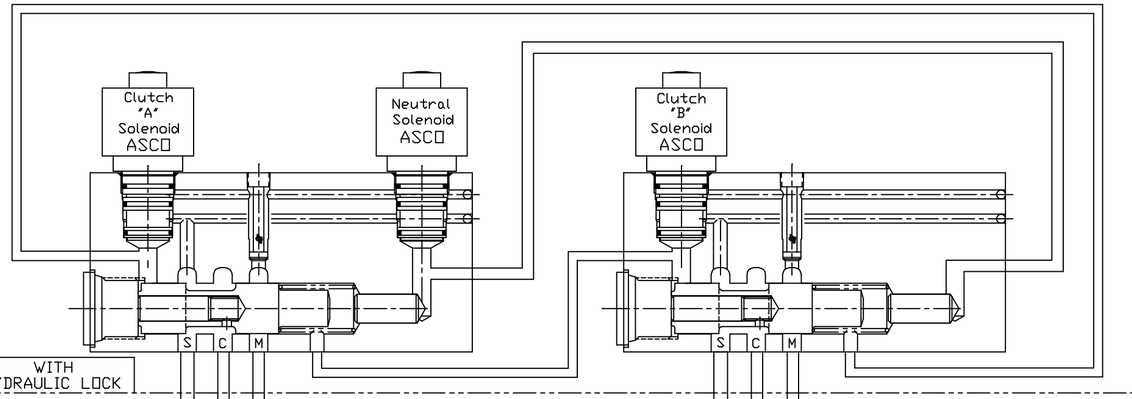
SHEET 1_ OF 1_ | REV _C_



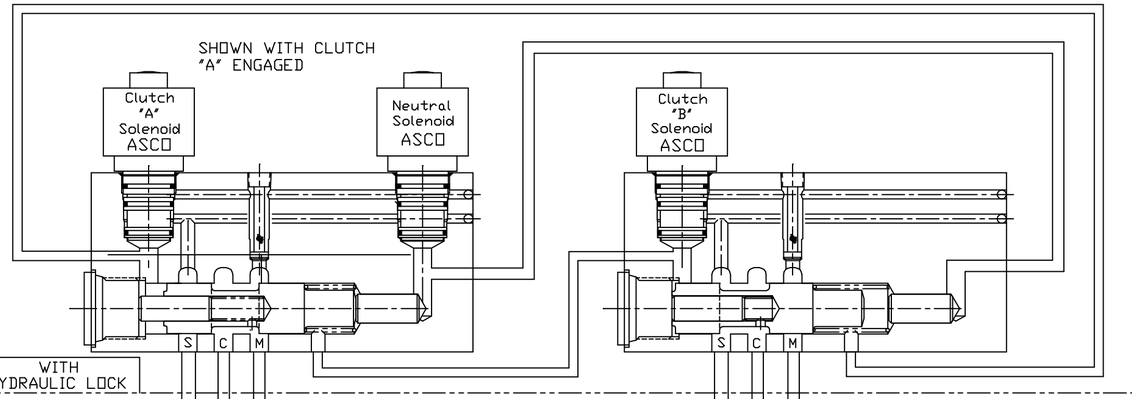

WITHOUT HYDRAULIC LOCK



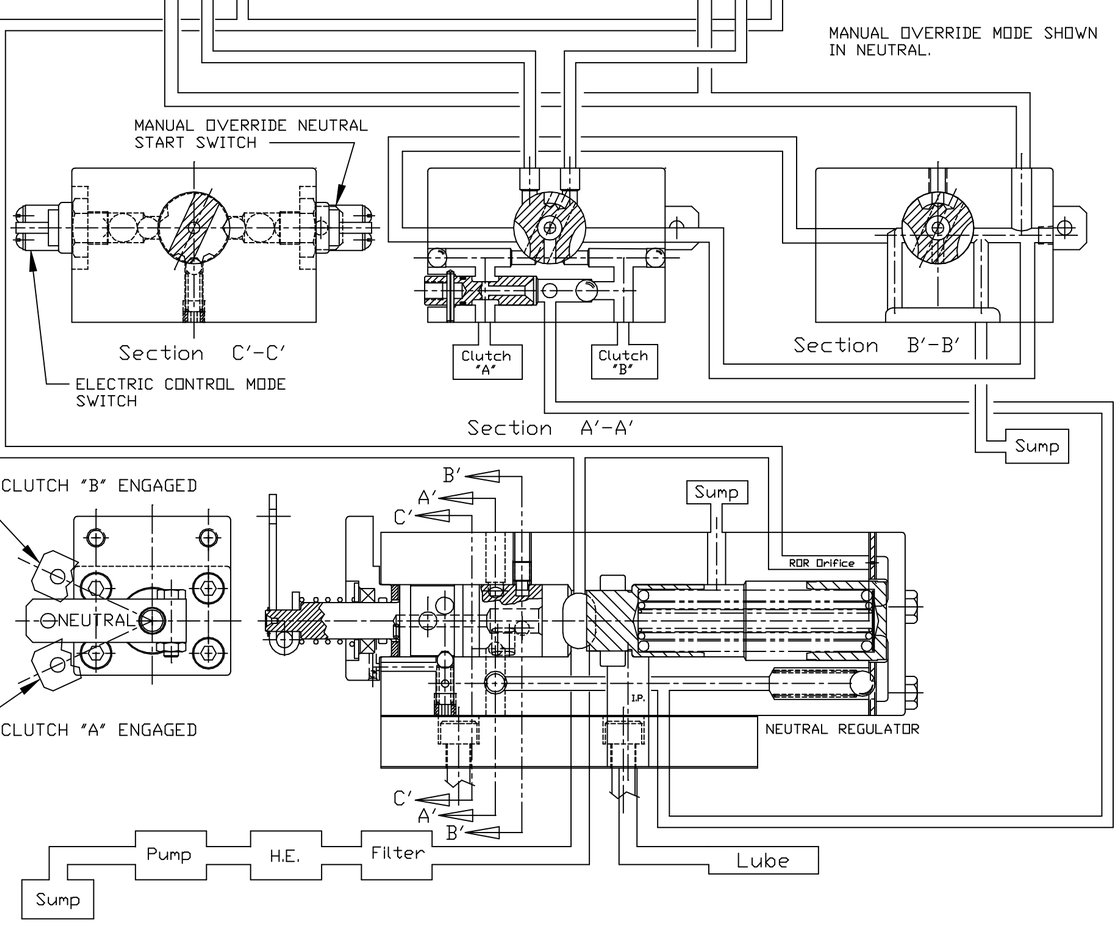

WITHOUT HYDRAULIC LOCK



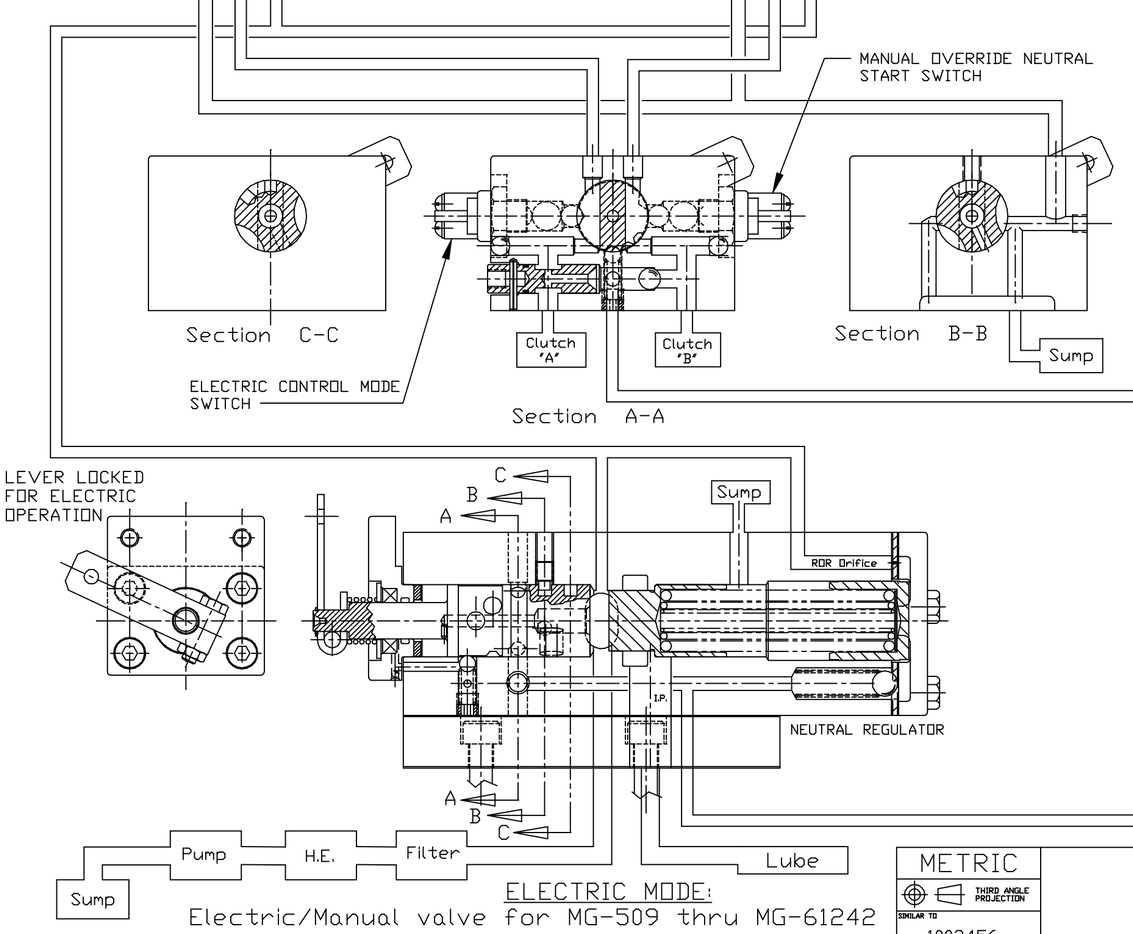

WITH HYDRAULIC LOCK




WITH HYDRAULIC LOCK




MANUAL MODE: ELECTRIC/MANUAL VALVE FOR MG-509 THRU MG-61242
(REFERENCE VALVE ASSEMBLY NO. 1018084)




ELECTRIC MODE:
Electric/Manual valve for MG-509 thru MG-61242
(REFERENCE VALVE ASSEMBLY NO. 1018084)

C = CLUTCH APPLY
I.P. = INTERMEDIATE PRESS. (LUBE)
M = MAIN PRESS.
S = SUMP

| SHEET | REV | ZONE | CH. NO. | DATE |
|---|---|---|---|---|
| 3 | A | | 29314 | 4-27-99 |

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MATERIAL
HEAT TREAT
SURFACE TREATMENT
WEIGHT kg
FIRST USE
ASSY.
MODEL
NAME

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE mm
MACHINED DIMENSIONS
X.X ±0.75
X.XX ±0.25
X.XXX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DIAGRAM, HYDRAULIC
(WITHOUT TROLLING VALVE)

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO
1002456

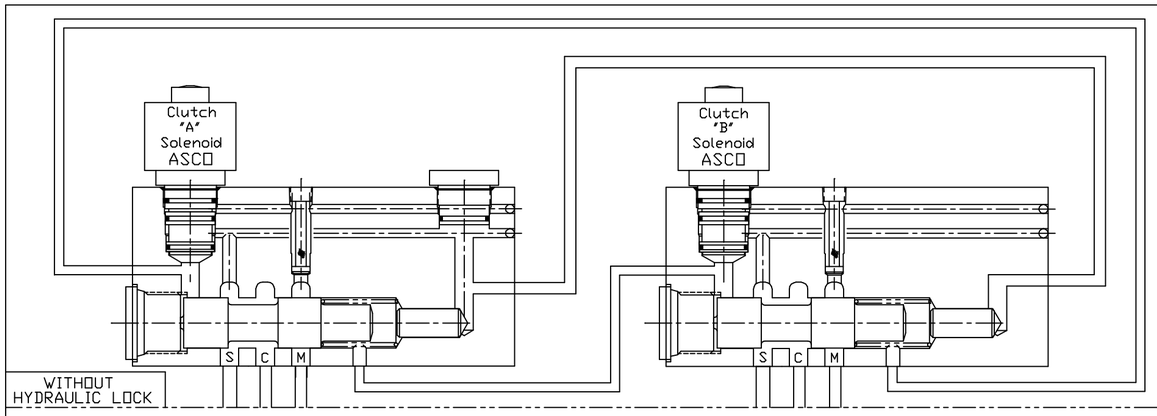
DATE 3-30-98
SCALE 1.00 = 1.00
DRN. RM
CHK. BJE
APPD. DAS

TWIN DISC INCORPORATED
RACINE, WI 53403 - USA

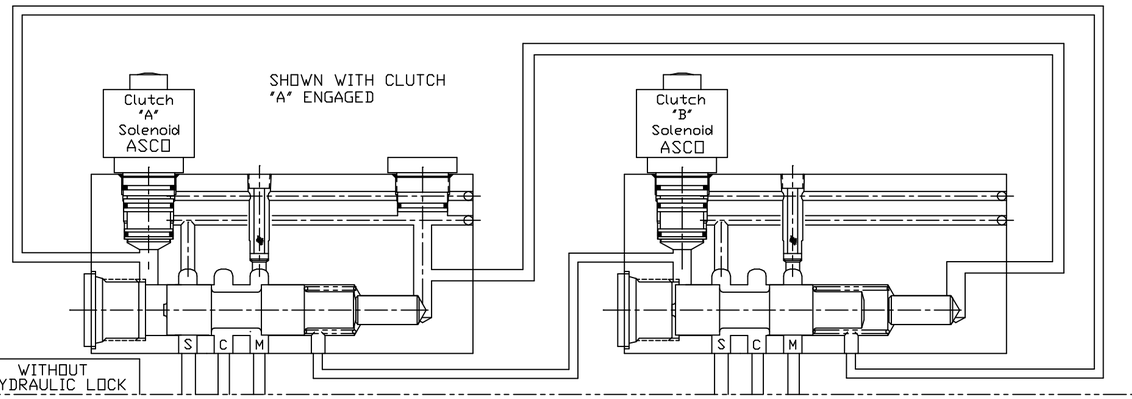
A7119W

SHEET 1 OF 3 REV -A-

E D C B A
6 5 4 3 2 1




WITHOUT HYDRAULIC LOCK

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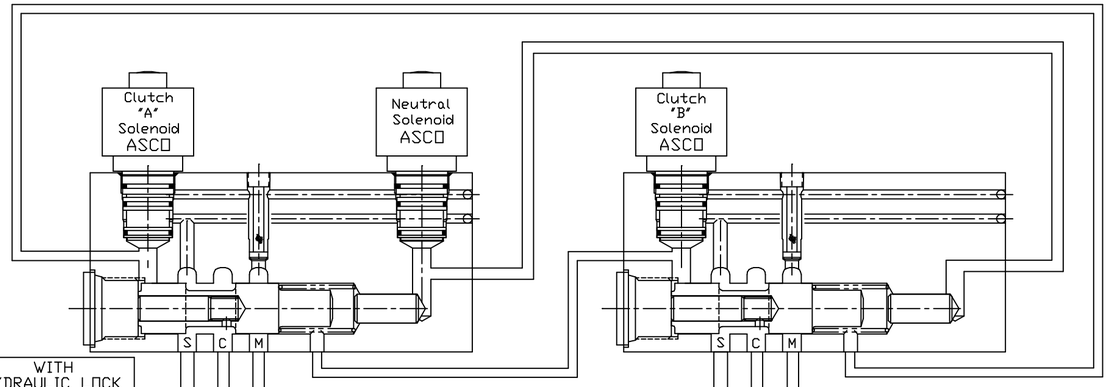
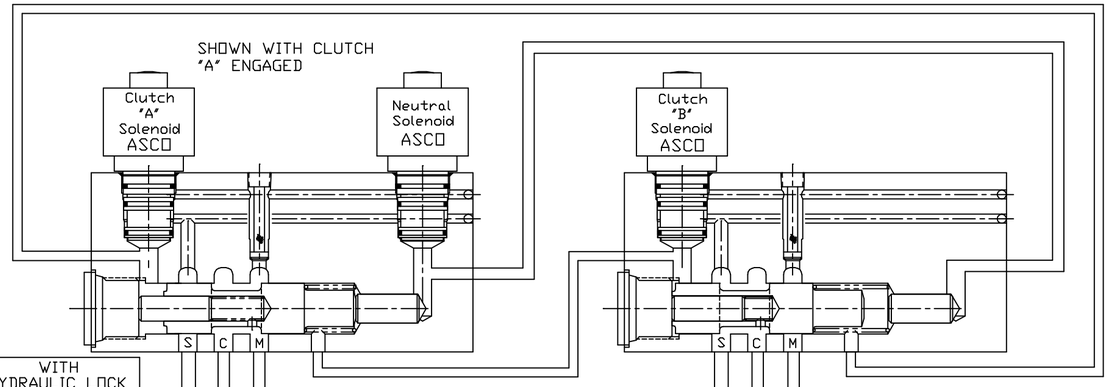
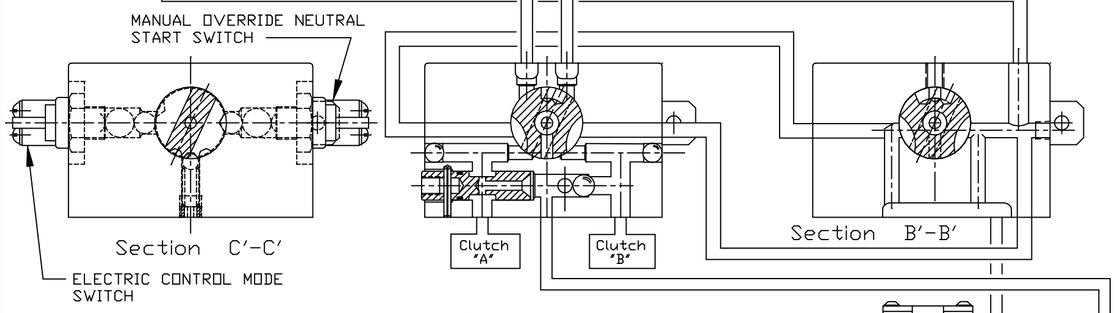


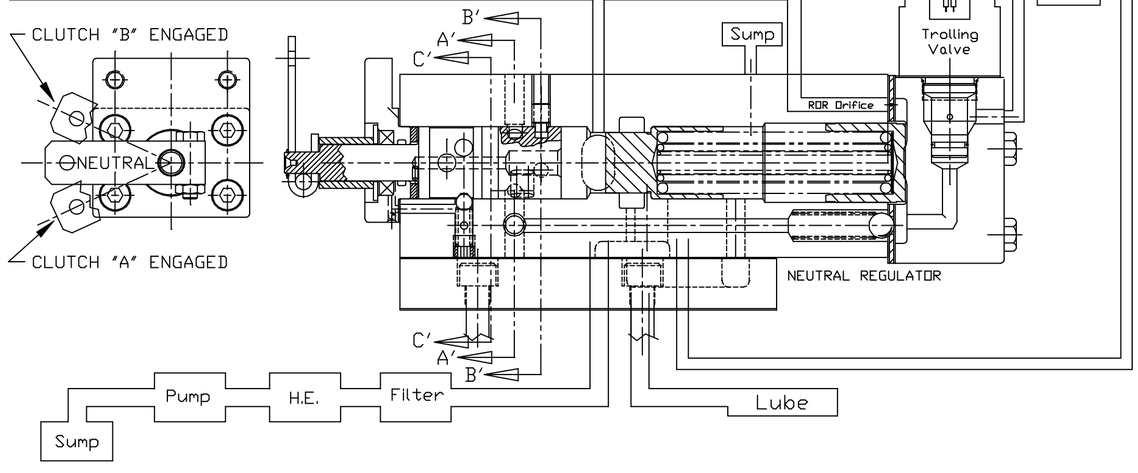

WITH HYDRAULIC LOCK



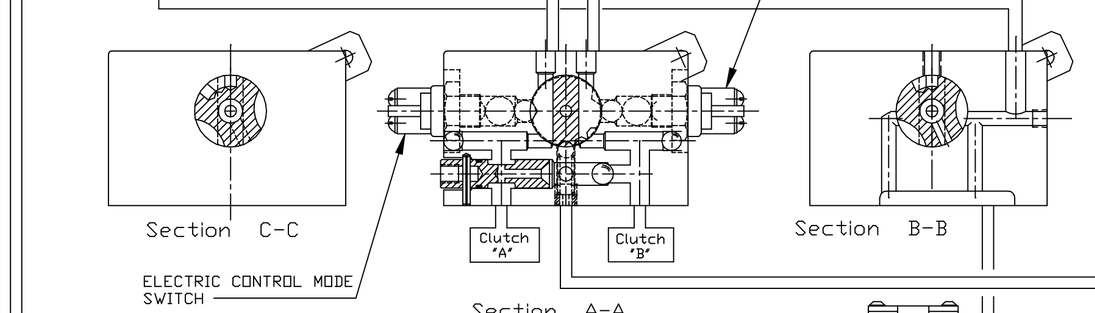

WITH HYDRAULIC LOCK

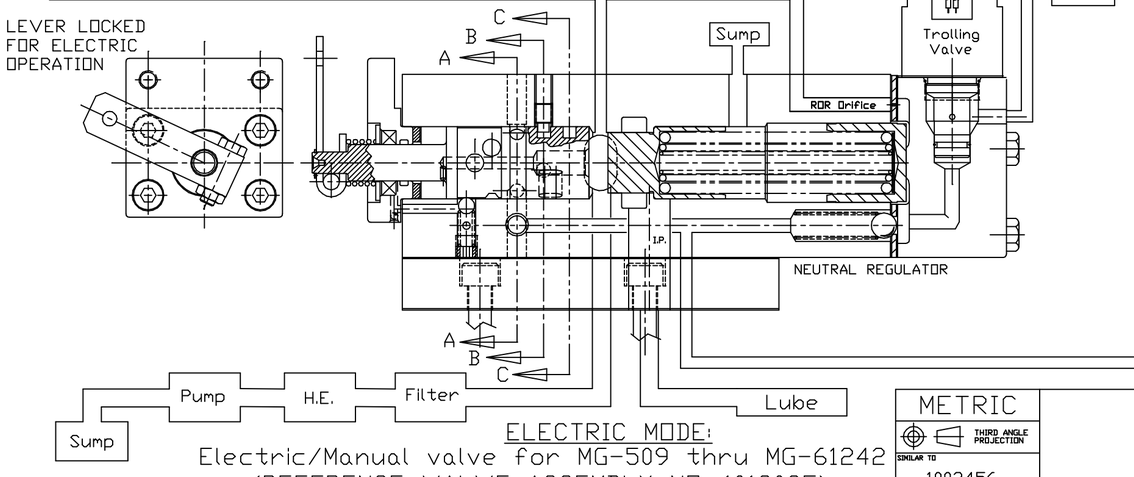
MANUAL OVERRIDE MODE SHOWN IN NEUTRAL.




MANUAL MODE: ELECTRIC/MANUAL VALVE FOR MG-509 THRU MG-61242 (REFERENCE VALVE ASSEMBLY NO. 1018085)




ELECTRIC MODE: Electric/Manual valve for MG-509 thru MG-61242 (REFERENCE VALVE ASSEMBLY NO. 1018085)

C = CLUTCH APPLY
I.P. = INTERMEDIATE PRESS. (LUBE)
M = MAIN PRESS.
S = SUMP

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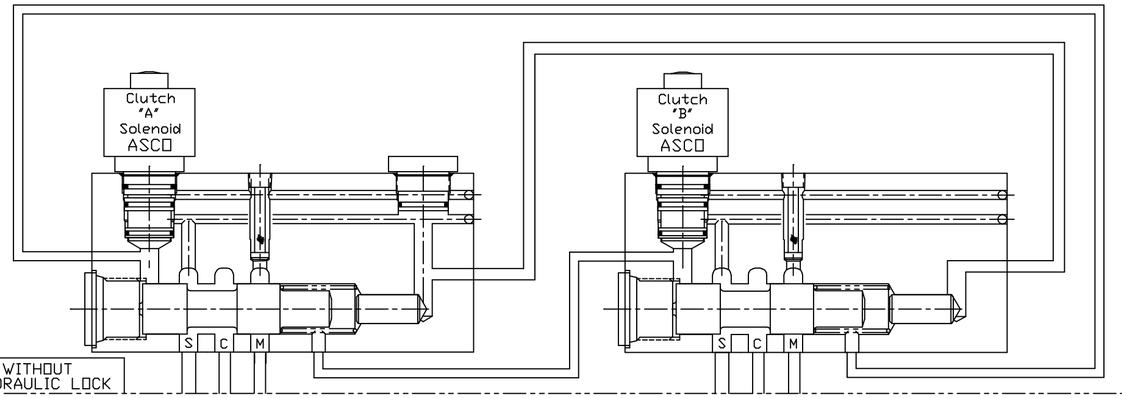
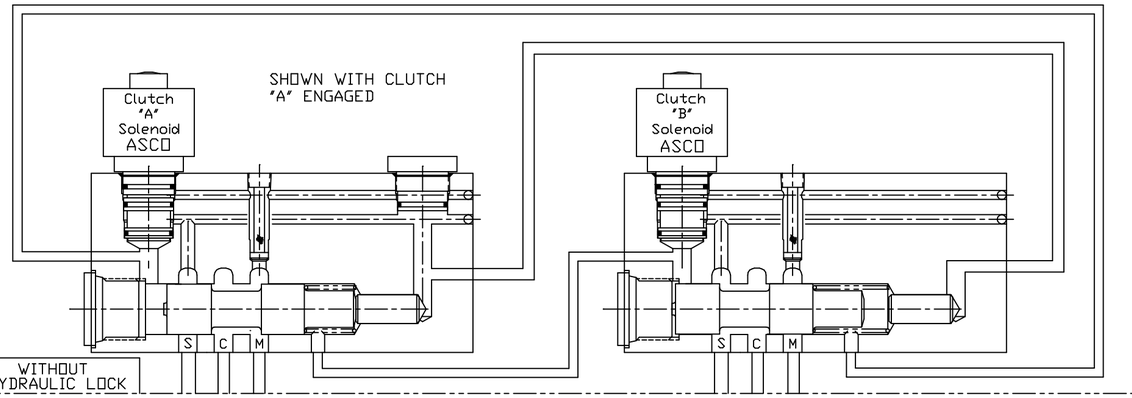
| | |
|---|---|
| METRIC | THIRD ANGLE PROJECTION |
| SIMILAR TO | 1002456 |
| MATERIAL | |
| HEAT TREAT | |
| SURFACE TREATMENT | |
| WEIGHT | kg / N m |
| FIRST USE | |
| ASSY. | |
| MODEL | |
| NAME | DIAGRAM, HYDRAULIC (WITH TROLLING VALVE) |
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE m/m MACHINED DIMENSIONS X.X ±0.25 X.XX ±0.13 X.XXX ±0.13 ALL ANGULAR TOLERANCES ±1° GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982 | |
| DATE | 3-30-98 |
| SCALE | 1.00 = 1.00 |
| DRN. | RM |
| CHK. | BJE |
| APPR. | DAS |
| TWIN DISC INCORPORATED RACINE, WI 53403 - USA | |
| A7119W | |
| SHEET 2 OF 3 | REV A |

E D C B A

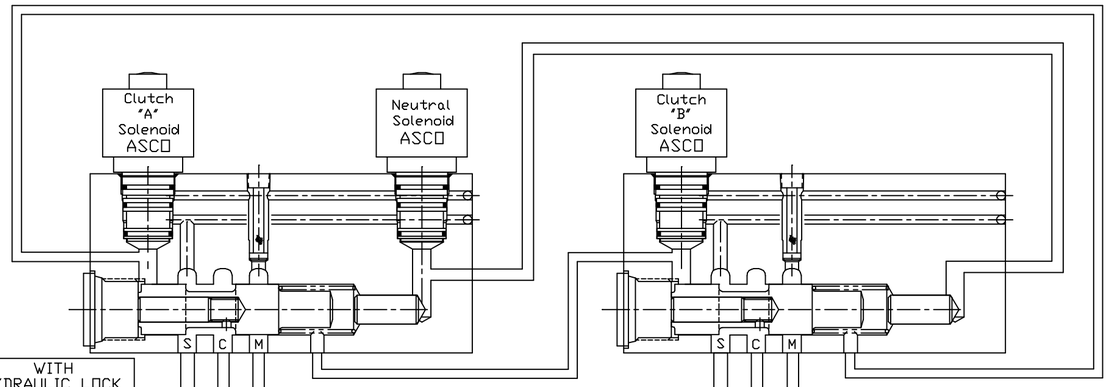
6 5 4 3 2 1



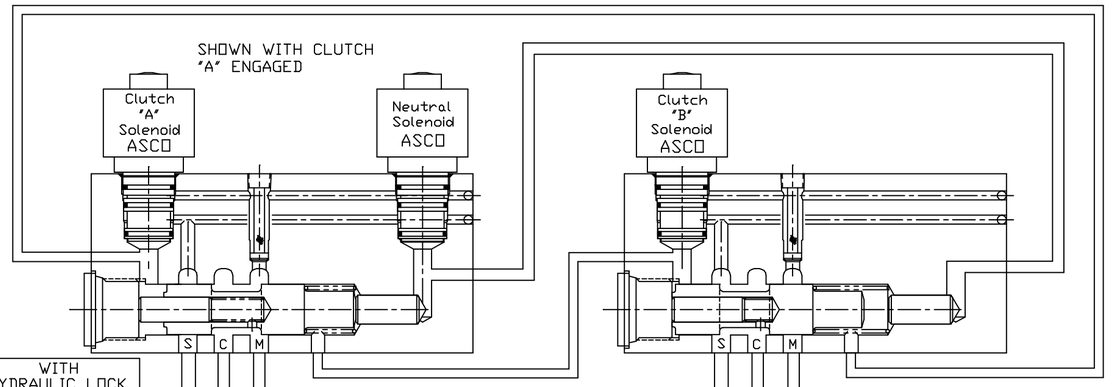

WITHOUT HYDRAULIC LOCK




WITHOUT HYDRAULIC LOCK

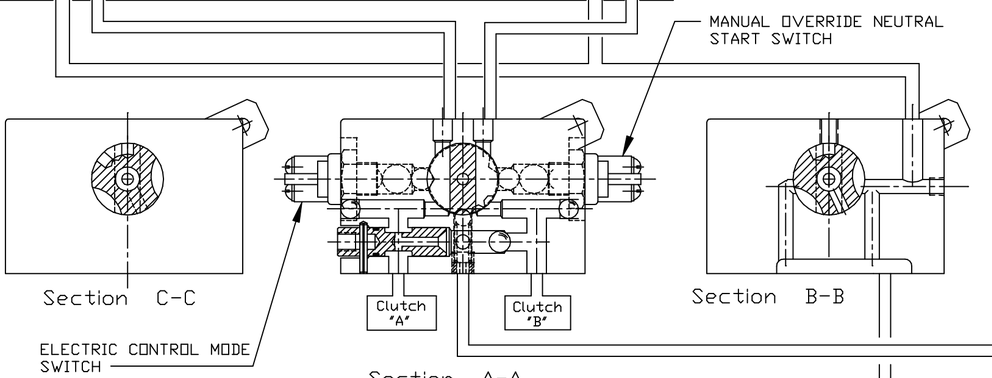


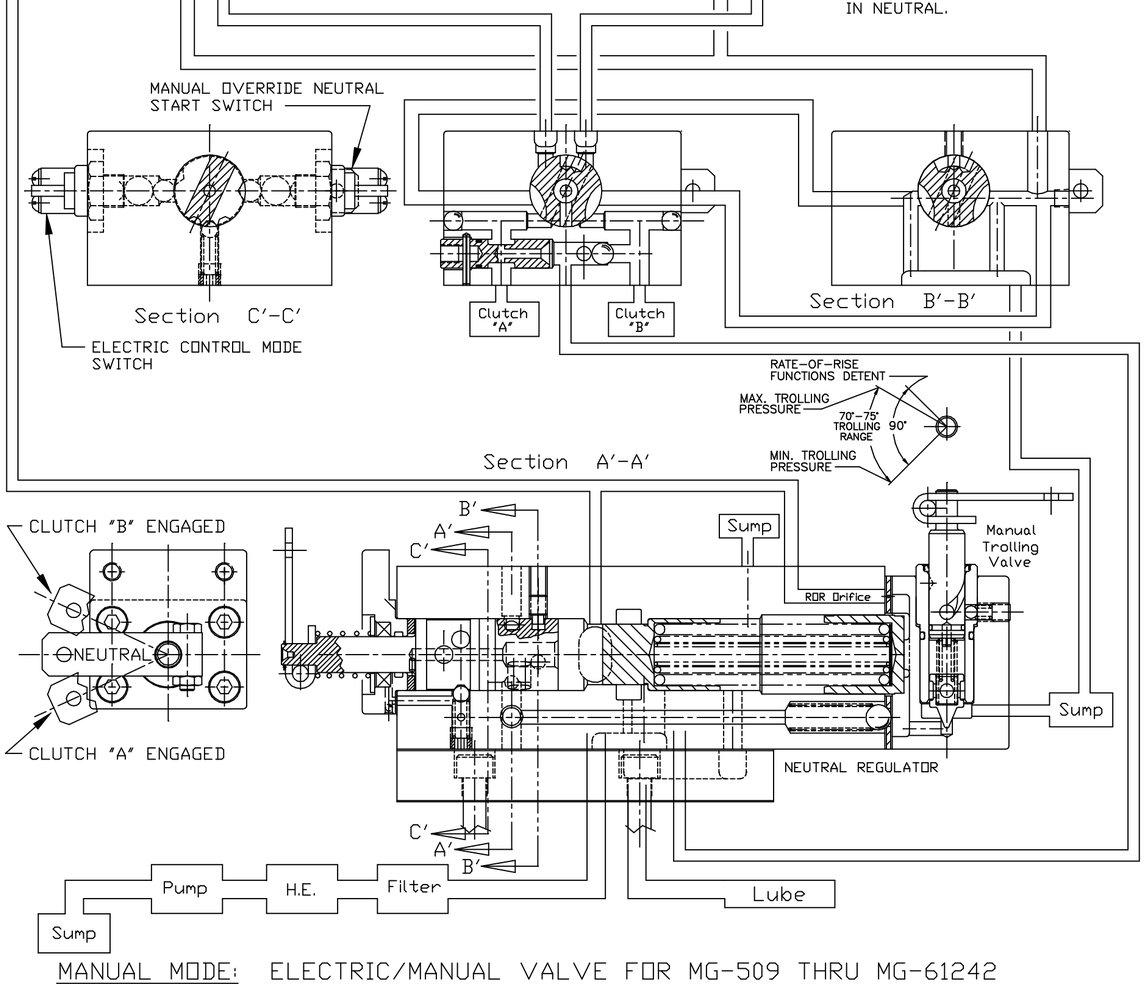

WITH HYDRAULIC LOCK



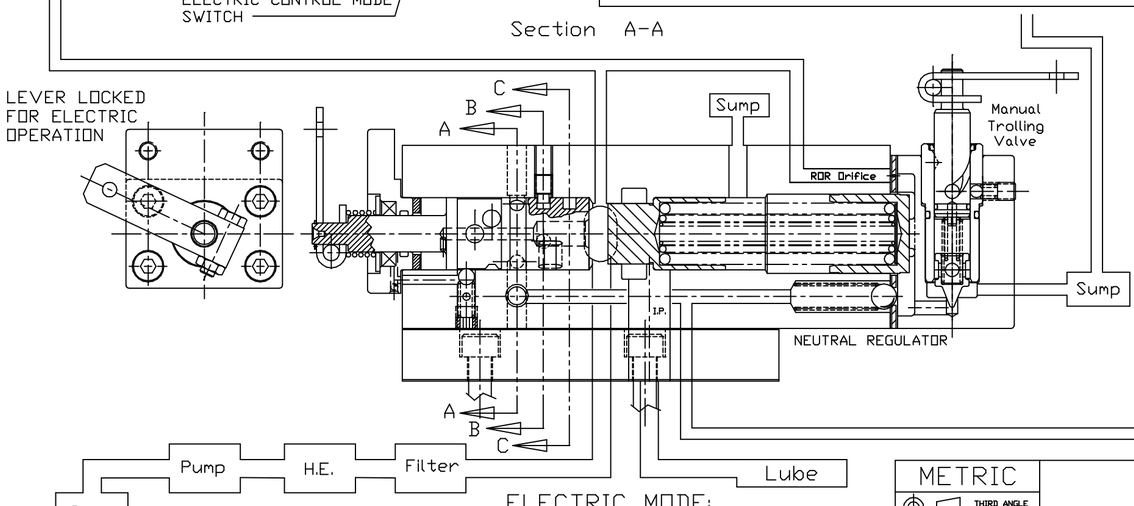

WITH HYDRAULIC LOCK

MANUAL OVERRIDE MODE SHOWN IN NEUTRAL.




MANUAL MODE: ELECTRIC/MANUAL VALVE FOR MG-509 THRU MG-61242
(REFERENCE VALVE ASSEMBLY NO. 1018440)




ELECTRIC MODE:
Electric/Manual valve for MG-509 thru MG-61242
(REFERENCE VALVE ASSEMBLY NO. 1018440)

C = CLUTCH APPLY
I.P. = INTERMEDIATE PRESS. (LUBE)
M = MAIN PRESS.
S = SUMP

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METRIC
THIRD ANGLE PROJECTION
SIMILAR TO 1002456

MATERIAL
HEAT TREAT
SURFACE TREATMENT
WEIGHT kg
FIRST USE
ASSY.
MODEL
NAME DIAGRAM, HYDRAULIC (WITH TROLLING VALVE)

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE
SCALE 1.00 = 1.00
DRN. RM
CHK. BJE
APPD.

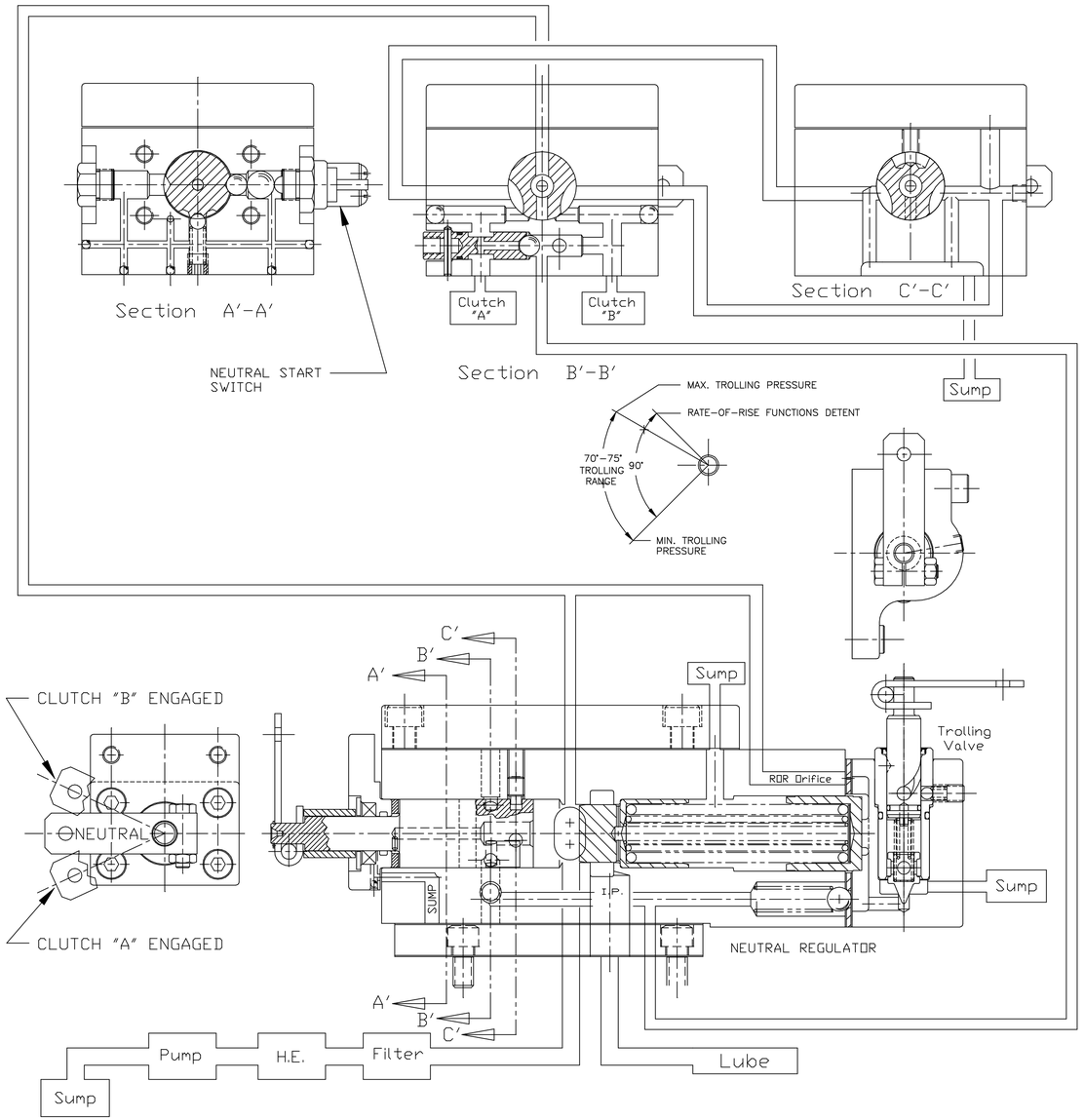
TWIN DISC INCORPORATED
RACINE, WI 53403 - USA

A7119W

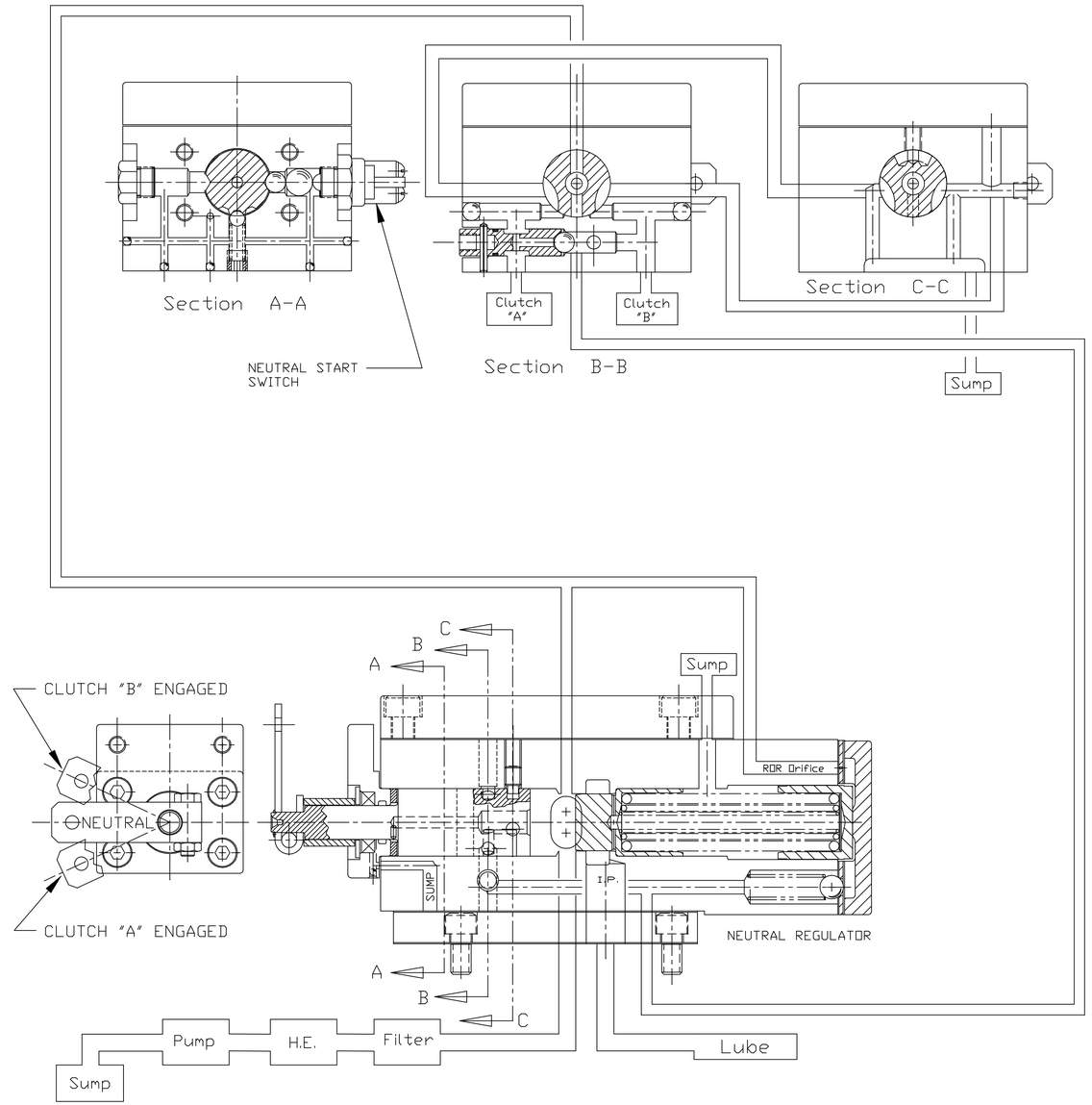
SHEET 3 OF 3 REV A

E D C B A

6 5 4 3 2 1




MANUAL CONTROL VALVE (WITH MANUAL TROLLING) FOR MG-509 THRU MG-61242
(REF. VALVE ASSEMBLY NO. 1017546)




MANUAL CONTROL VALVE FOR MG-509 THRU MG-61242
(REF. VALVE ASSEMBLY NO. 1017172)

C = CLUTCH APPLY
I.P. = INTERMEDIATE PRESS. (LUBE)
M = MAIN PRESS.
S = SUMP

| REV | ZONE | CH. NO. | DATE | REV | ZONE | CH. NO. | DATE |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

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MATERIAL
HEAT TREAT
SURFACE TREATMENT
WEIGHT kg
WR² N m²
FIRST USE
ASSY.
MODEL
NAME
DIAGRAM, HYDRAULIC

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X. ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

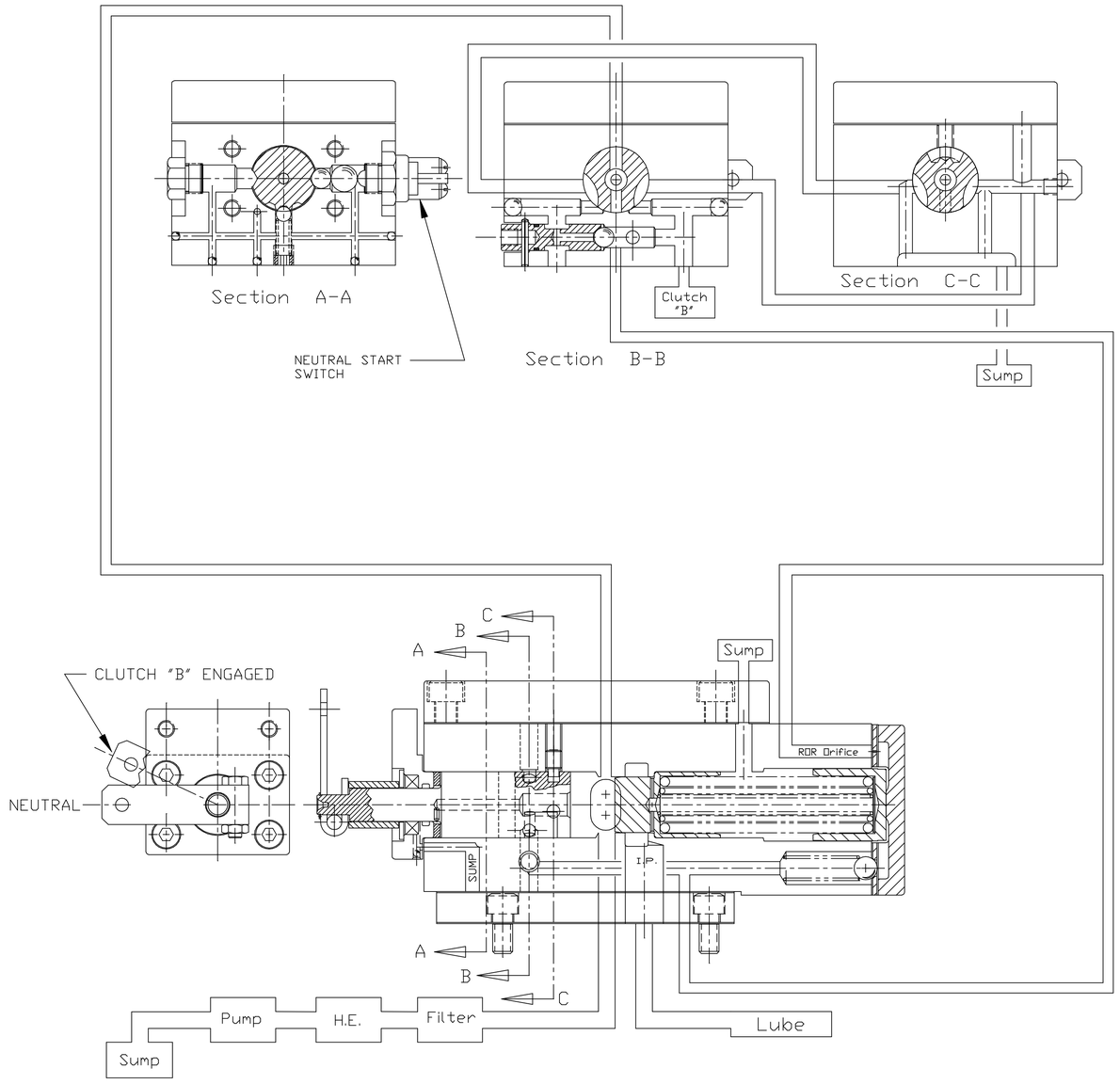
DATE 3-30-98
SCALE .75=1.00
DRN. BJE
CHK. RM
APPD. DAS

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO
1002456

TWIN DISC INCORPORATED
RACINE, WI 53403 - USA

A7119Y

SHEET 1 OF 2 REV ___




# MANUAL CONTROL VALVE FOR HYDRAULIC PTO's.
# (REF. VALVE ASSEMBLY NO. 1017172)

C = CLUTCH APPLY
I.P. = INTERMEDIATE PRESS. (LUBE)
M = MAIN PRESS.
S = SUMP

| REV | ZONE | CH. NO. | DATE | REV | ZONE | CH. NO. | DATE |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

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RACINE, WI 53403 - USA
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MATERIAL
HEAT TREAT
SURFACE TREATMENT
WEIGHT kg
WR² N m²
FIRST USE
ASSY.
MODEL
NAME DIAGRAM, HYDRAULIC

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE mm
MACHINED DIMENSIONS
X ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 12-16-99
SCALE .75=1.00
DRN. BJE
CHK. RM
APPD. DAS

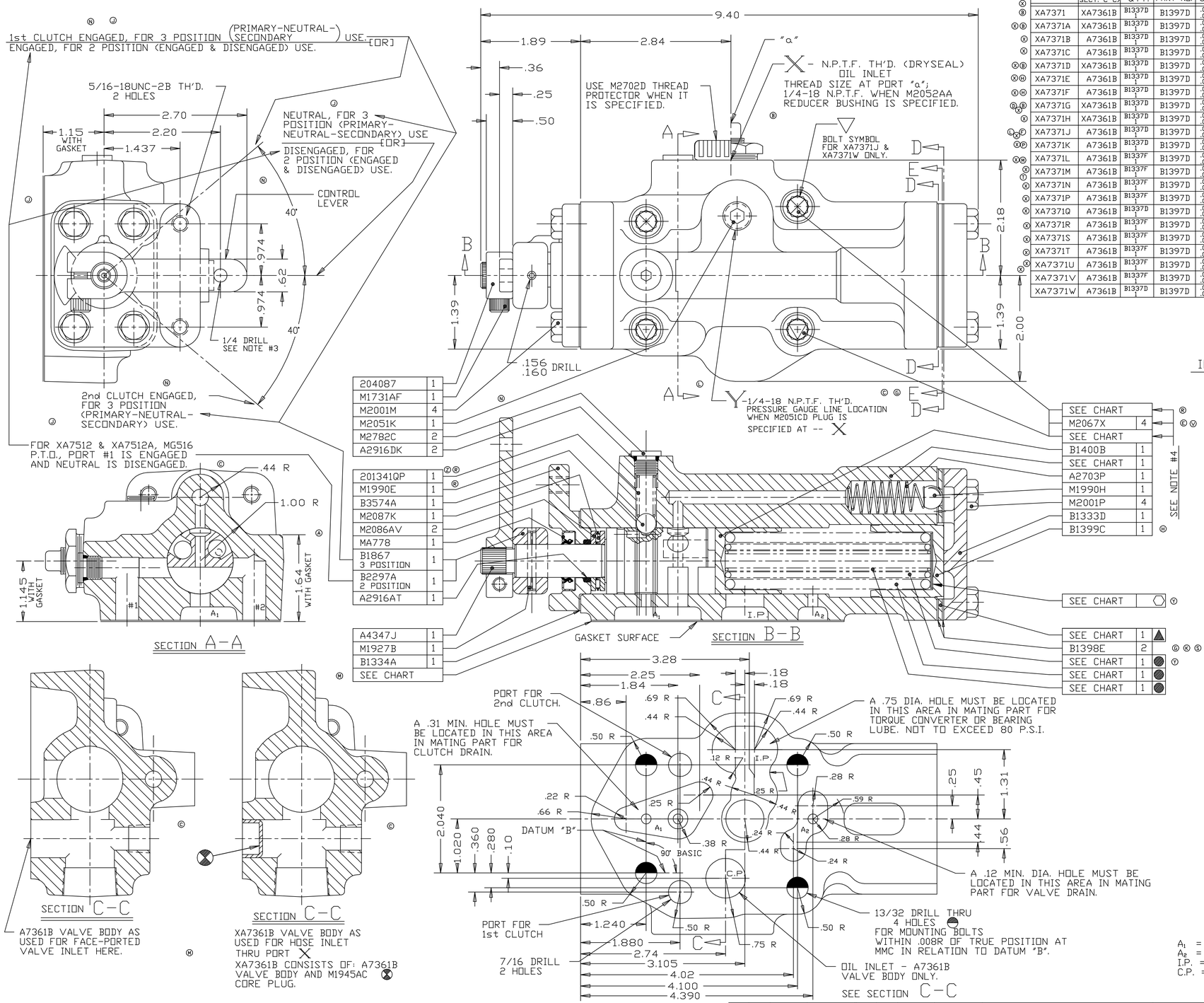
METRIC
THIRD ANGLE PROJECTION
SIMILAR TO 1002456

TWIN DISC INCORPORATED
RACINE, WI 53403 - USA

A7119Y

SHEET 2 OF 2 REV ___

| | VALVE ASSEMBLY NUMBER | VALVE BODY (SEE SECT. C-C) | VALVE BODY GASKET PART NO. QTY. | ORIFICE PLATE PART NO. | ORIFICE PLATE SIZE | X | VALVE SPRINGS SPRING ASS'Y. | VALVE SPRINGS CONSISTS OF: OUTER | VALVE SPRINGS CONSISTS OF: INNER | CLUTCH P.S.I. NOM. | Y | SHIMS PART NO. | SHIMS QTY. | 12 PT. SCREWS ⊗ | 12 PT. SCREWS QTY. | 12 PT. SCREWS ▽ | 12 PT. SCREWS QTY. | FIRST USE | DATE AND APPR. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ⓚ | XA7371 | XA7361B | B1337D | B1397D | .048 .052 | 3/4-14 M2702D ▼ | XA2707AD | A2707AD | A2703AB | 200 | NO | B2334 | USE AS REQUIRED | M2089F | 2 | M2089AA | 2 | MG514 | 9-3-80 REB JS BCA |
| ⒷⓀ | XA7371A | XA7361B | B1337D | B1397D | .048 .052 | 3/4-14 M2702D ▼ | XA2707AX | A2707AX | A2704BU | 230 | NO | B2334 | | M2089F | 2 | M2089AA | 2 | MG514 PL. CR. | 9-3-80 REB JS BCA |
| Ⓚ | XA7371B | A7361B | B1337D | B1397D | .048 .052 | M2052AA M2051L | XA2707AD | A2707AD | A2703AB | 200 | NO | B2334 | | M2089F | 2 | M2089AG | 2 | MG514C | 9-3-80 REB JS BCA |
| Ⓚ | XA7371C | A7361B | B1337D | B1397D | .048 .052 | M2052AA M2051L | XA2707AX | A2707AX | A2704BU | 230 | NO | B2334 | | M2089F | 2 | M2089AG | 2 | MG514C PL. CR. | 9-3-80 REB JS BCA |
| ⒷⓀ | XA7371D | XA7361B | B1337D | B1397D | .048 .052 | 3/4-14 M2702D ▼ | XA2707AX | A2707AX | A2704BU | 230 | NO | B2334 | | M2089F | 2 | M2089F | 2 | MG510 MG510A | 9-3-80 REB JS BCA |
| ⒽⓀ | XA7371E | A7361B | B1337D | B1397D | .048 .052 | M2052AA M2051L | -------- | A2707AD | -------- | 160 | NO | B2334 | | M2089F | 2 | M2089F | 2 | MG518 MG518-1 | 9-3-80 REB JS BCA |
| ⒽⓀ | XA7371F | A7361B | B1337D | B1397D | .048 .052 | M2052AA M2051L | XA2707BZ | A2707BW | A2703BA | 150 | NO | B2334 | | M2089F | 2 | M2089S | 2 | MG520 MG520-1 | 9-3-80 REB JS BCA |
| ⒹⒺⓀ | XA7371G | XA7361B | B1337D | B1397D | .048 .052 | 3/4-14 M2702D ▼ | XA2707AD | A2707AD | A2703AB | 200 | NO | B2334 | | M2089F | 2 | M2089S | 2 | MG509 | 9-3-80 REB JS BCA |
| Ⓚ | XA7371H | XA7361B | B1337D | B1397D | .048 .052 | 3/4-14 M2702D ▼ | XA2707Z | A2707Z | A2703T | 180 | NO | B2334 | | M2089F<br>M2089F | 2<br>2 | M2089F<br>M2089AA | 2<br>2 | M5521 & M5527<br>MG512 ONLY | 10-14-83 REB JS BCA |
| ⒻⓀ | XA7371J | A7361B | B1337D | B1397D | .048 .052 | 3/4-14 M2051CD | XA2707AD | A2707AD | A2703AB | 200 | YES | B2334 | | M2089Y | 1 | M2089F | 3 | MG516 | 3-27-84 REB JS BCA |
| ⓀⓅ | XA7371K | A7361B | B1337D | B1397D | .048 .052 | 3/4-14 M2051CD | -------- | OUTER (CENTER) A2707BD | INNER A2702BC | 250 | YES | B2334 | | M2089L | 2 | M2089L | 2 | MG516 P.T.O. | 7-28-86 REB JS BCA |
| ⓀⓂ | XA7371L | A7361B | B1337F | B1397D | .048 .052 | 3/4-14 M2702D ▼ | XA2707AX | A2707AX | A2704BU | 230 | NO | B2334 | | M2089F | 2 | M2089F | 2 | MG5111 SERIES | 4-30-87 REB BCA |
| Ⓚ | XA7371M | A7361B | B1337F | B1397D | .048 .052 | 3/4-14 M2702D ▼ | -------- | OUTER (CENTER) A2707BD | INNER A2704CE,A2702BC | 250 | YES | B2334 | | M2089H | 2 | M2089H | 2 | MG5111A P.T.O. | 9-17-87 REB JS BCA |
| Ⓚ | XA7371N | A7361B | B1337F | B1397D | .048 .052 | 3/4-14 M2051CD | XA2707AX | A2707AX | A2704BU | 230 | YES | B2334 | | M2089P | 2 | M2089P | 2 | MG5111 SERIES W.P.T.O. Ⓑ | 10-21-87 JS BCA |
| Ⓚ | XA7371P | A7361B | B1337F | B1397D | .048 .052 | 3/4-14 M2051CD | XA2707AX | A2707AX | A2704BU | 230 | YES | B2334 | | M2089AR | 2 | M2089AR | 2 | MG5141 | 9-4-90 JS TBC |
| Ⓚ | XA7371Q | A7361B | B1337D | B1397D | .048 .052 | M2052AA M2051L | XA2707AD | A2707AD | A2703AB | 200 | NO | B2334 | | M2089F | 2 | M2089F | 2 | MG518-1 | 5-21-92 KS TBC |
| Ⓚ | XA7371R | A7361B | B1337F | B1397D | .048 .052 | 3/4-14 M2702D ▼ | ------- | OUTER (CENTER) A2707BD | INNER A2704CE,A2702BC | 250 | NO | B2334 | | M2089F | 2 | M2089F | 2 | MG5090A | 7-21-92 JS TBC |
| Ⓚ | XA7371S | A7361B | B1337F | B1397D | .048 .052 | 3/4-14 M2051CD | XA2707AX | A2707AX | A2704BU | 230 | YES | B2334 | | M2089F | 2 | M2089F | 2 | MG5182 SERIES | 12-10-92 JS TBC |
| Ⓚ | XA7371T | A7361B | B1337F | B1397D | .048 .052 | 3/4-14 M2051CD | -------- | OUTER (CENTER) A2707BD | INNER A2704BU,A2702BC | 250 | YES | B2334 | | M2089AS | 2 | M2089AS | 2 | MG5141 P.T.O. | 7-18-94 DAS TBC |
| Ⓚ | XA7371U | A7361B | B1337F | B1397D | .048 .052 | 3/4-14 M2051CD | -------- | OUTER (CENTER) A2707BD | INNER A2704BU,A2702BC | 250 | YES | B2334 | | M2089AR | 2 | M2089AR | 2 | MG5141 | 9-12-95 DAS TBC |
| Ⓚ | XA7371V | A7361B | B1337F | B1397D | .048 .052 | 3/4-14 M2702D ▼ | -------- | OUTER (CENTER) A2707BD | INNER A2704CE,A2702BC | 270 | NO | B2334 | 4 | M2089F | 2 | M2089F | 2 | MG5090A MG5091SC | 6-13-96 JS DAS |
| Ⓚ | XA7371W | A7361B | B1337D | B1397D | .048 .052 | 3/4-14 M2051CD | -------- | OUTER (CENTER) A2707BD | INNER A2704BU,A2702BC | 250 | YES | B2334 | | M2089Y | 1 | M2089F | 3 | MG-5170DC | 6-9-97 ALC DAS |




| | |
|---|---|
| 204087 | 1 |
| M1731AF | 1 |
| M2001M | 4 |
| M2051K | 1 |
| M2782C | 2 |
| A2916DK | 2 |

| | |
|---|---|
| 201341QP | 1 |
| M1990E | 1 |
| B3574A | 1 |
| M2087K | 1 |
| M2086AV | 2 |
| MA778 | 1 |
| B1867 3 POSITION | 1 |
| B2297A 2 POSITION | 1 |
| A2916AT | 1 |

| | |
|---|---|
| A4347J | 1 |
| M1927B | 1 |
| B1334A | 1 |
| SEE CHART | |

| | |
|---|---|
| SEE CHART | |
| M2067X | 4 |
| SEE CHART | |
| B1400B | 1 |
| SEE CHART | 1 |
| A2703P | 1 |
| M1990H | 1 |
| M2001P | 4 |
| B1333D | 1 |
| B1399C | 1 |

| | |
|---|---|
| SEE CHART | |

| | |
|---|---|
| SEE CHART | 1 |
| B1398E | 2 |
| SEE CHART | 1 |
| SEE CHART | 1 |
| SEE CHART | 1 |

TEST VALVES PER TEST SPEC. NO. CONTAINED IN VALVE SPECIFICATION

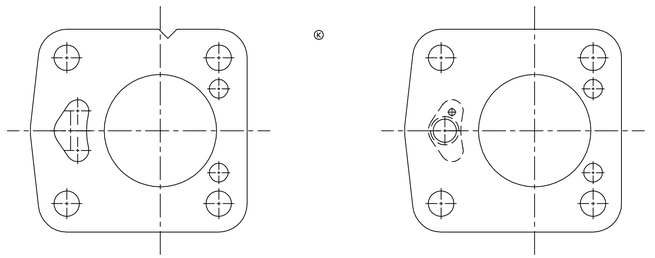
INSTALLATION DATA:

1.) VALVE SUITABLE FOR UP TO 25 G.P.M.

2.) CLUTCH PRESSURE IN NEUTRAL WILL BE BETWEEN 30 AND 90 P.S.I. DEPENDING UPON SPRING ASS'Y. USED, G.P.M. THRU VALVE AND INTERMEDIATE PRESSURE.

Ⓩ 3.) 4-14 lbf AT THE 2.20R LOCATION OF THE 1/4 DIA. HOLE IS REQUIRED TO OVERCOME DETENT EFFORT. REMOTE CONTROL VALVE ACTUATOR MUST Ⓤ PROVIDE ±1.41 LINEAR TRAVEL FROM NEUTRAL AT THE 1/4 DIA. HOLE LOCATION. (WHEN SUITABLE REMOTE CONTROLS ARE USED, THE DETENT Ⓥ SPRINGS AND BALL MAY BE OMITTED, THEN THE FORCE WILL BECOME 3-7 LBS.) THE DETENT FEATURE IS PROVIDED IN THE FULL 1st CLUTCH ENGAGED, FULL 2nd CLUTCH ENGAGED AND NEUTRAL LEVER POSITIONS.

4.) TORQUE MOUNTING BOLTS TO 30-36 LB.-FT., "AS RECEIVED" (PER S574) OR 25-29 LB.-FT., "LUBRICATED" (PER S574), AFTER TORQUING MOUNTING Ⓒ BOLTS, INSTALL M2026Q PLUGS IN MOUNTING BOLT COUNTERBORES.




Ⓑ GENERAL NOTES:

▼ REMOVE BEFORE OPERATING UNIT, ALUMINUM THREAD PROTECTOR.

$A_1$ = ATMOSPHERIC PRESSURE
$A_2$ = ATMOSPHERIC PRESSURE
I.P. = INTERMEDIATE PRESSURE
C.P. = CLUTCH PRESSURE

THIRD ANGLE PROJECTION

SIMILAR TO XA7360-G SERIES

| REV | ZONE | CH. NO. | DATE | REV | ZONE | CH. NO. | DATE |
|---|---|---|---|---|---|---|---|
| Z | E-4 | 28958 | 1-21-99 | | | | |
| Y | C-3 | 27992 | 8-8-97 | | | | |
| X | C-6 | 27018 | 6-13-96 | | | | |
| W | B-4 | 26182 | 8-21-95 | | | | |
| V | B-4 | 24983 | 5-16-94 | | | | |

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MATERIAL: -------
HEAT TREAT: -------
SURFACE TREATMENT:
WEIGHT: LBS. WR²: LBS. IN²
FIRST USE
ASSY. SEE CHART
MODEL
NAME: VALVE ASS'Y.-CONTROL

UNLESS OTHERWISE SPECIFIED
MACHINED DIMENSIONS
XX ±0.030
XXX ±0.010
XXXX ±0.005
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 9-3-80
SCALE 1.00=1"
DRN. KS
CHK. REB JS
APPD. BCA

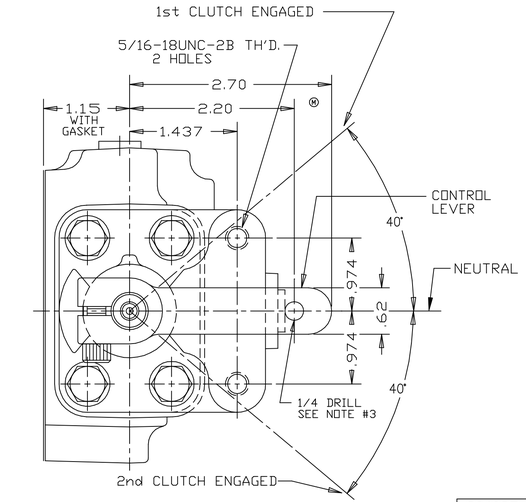
TWIN DISC INCORPORATED RACINE, WI 53403 - USA

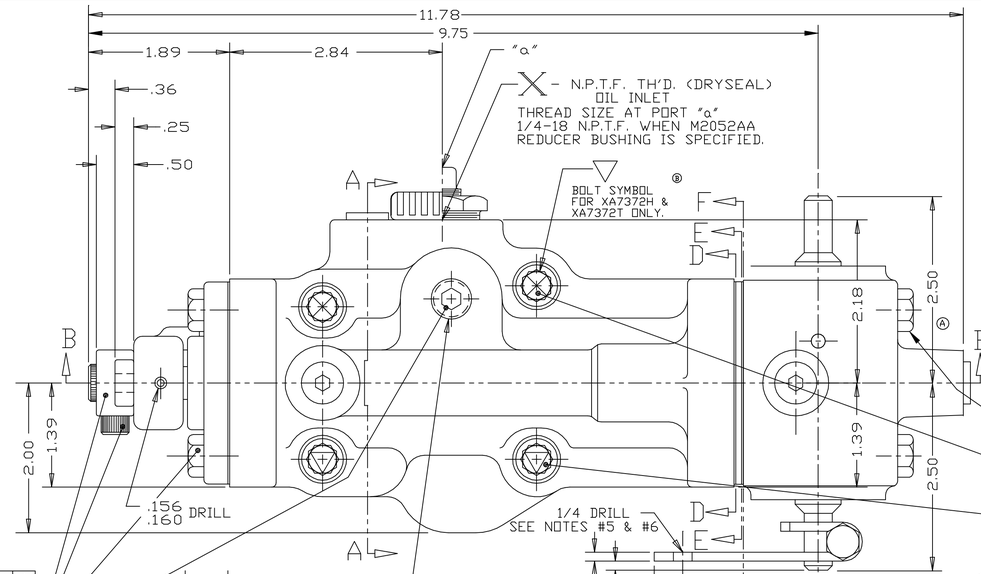
XA7371 SERIES

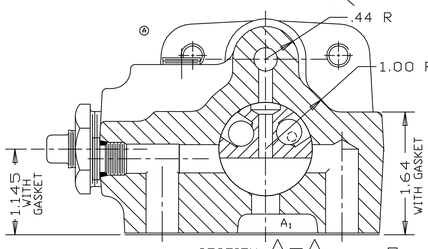
SHEET 1 OF 1 REV Z

File name: XA7371

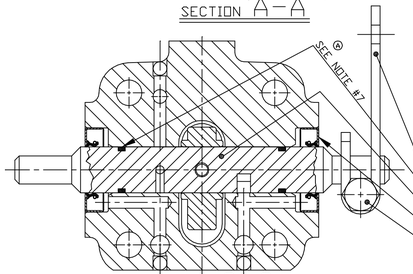
| VALVE ASSEMBLY NUMBER | VALVE BODY (SEE SECT. G-G) | VALVE BODY GASKET PART NO. QTY. | ORIFICE PLATE PART NO. | ORIFICE PLATE SIZE | X | Y | SPACER ■ PART NO. | SPACER ■ QTY. | VALVE SPRINGS ● SPRING ASS'Y. | VALVE SPRINGS ● CONSISTS OF: OUTER | VALVE SPRINGS ● CONSISTS OF: INNER | CLUTCH P.S.I. NOM. | 12 PT. SCREWS ⊗ | 12 PT. SCREWS ⊗ QTY. | 12 PT. SCREWS ▽ | 12 PT. SCREWS ▽ QTY. | INSTR. PLATE NO. ◉ | FIRST USE | DATE AND APPR. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XA7372 | XA7361B | B1337D 2 | B1397C | .060 .064 | 3/4-14 M2702D ▼ | NO | B3576A | 1 | XA2707CA | A2707BX | A2705AT | 200 | M2089L | 2 | M2089AQ | 2 | B2464 | MG514 | 3-1-88 MCB JS BCA |
| XA7372A | XA7361B | B1337D 2 | B1397C | .060 .064 | 3/4-14 M2702D ▼ | NO | B3576A | 1 | XA2707CE | OUTER A2707BX | CENTER/INNER A2705AT/A2702BW | 230 | M2089L | 2 | M2089AQ | 2 | B2464 | MG514 PL. CR. | 3-1-88 MCB JS BCA |
| XA7372B | A7361B | B1337D 1 | B1397C | .060 .064 | M2052AA M2051L | NO | | | XA2707CA | A2707BX | A2705AT | 200 | M2089F | 2 | M2089AG | 2 | B2464 | MG514C | 2-24-88 MCB JS BCA |
| XA7372C | A7361B | B1337D 1 | B1397C | .060 .064 | M2052AA M2051L | NO | | | XA2707CE | OUTER A2707BX | CENTER/INNER A2705AT/A2702BW | 230 | M2089F | 2 | M2089AG | 2 | B2464 | MG514C PL. CR. | 3-24-88 MCB JS BCA |
| XA7372D | XA7361B | B1337D 1 | B1397C | .060 .064 | 3/4-14 M2702D ▼ | NO | | | XA2707CB | OUTER A2707BX | CENTER/INNER A2705AT/A2702BW | 230 | M2089F | 2 | M2089F | 2 | B2384 | MG510 MG510A | 3-24-88 MCB JS BCA |
| XA7372E | A7361B | B1337D 1 | B1397C | .060 .064 | M2052AA M2051L | NO | | | XA2707CC | A2707BV | A2704CX | 160 | M2089F | 2 | M2089F | 2 | B2464 | MG518 | 3-24-88 MCB JS BCA |
| XA7372F | A7361B | B1337D 1 | B1397C | .060 .064 | M2052AA M2051L | NO | | | XA2707AV | A2707BV | A2703BA | 150 | M2089F | 2 | M2089F | 2 | B2464 | MG520 | 3-24-88 MCB JS BCA |
| XA7372G | XA7361B | B1337D 2 | B1397C | .060 .064 | 3/4-14 M2702D ▼ | NO | B3576A | 1 | XA2707CA | A2707BX | A2705AT | 200 | M2089L | 2 | M2089AN | 2 | B2384 | MG509 | 1-15-90 MCB JS BCA |
| XA7372H | A7361B | B1337D 1 | B1397C | .060 .064 | M2051CD | YES | | | XA2707CA | A2707BX | A2705AT | 200 | M2089Y | 1 | M2089F | 3 | B2464 | MG516 | 7-10-84 MCB JS BCA |
| XA7372J | A7361B | B1337F 1 | B1397F | .090 .096 | 3/4-14 M2702D ▼ | NO | | | PX10241 | OUTER P102411 | CENTER/INNER A2704CW/A2702BW | 230 | M2089F | 2 | M2089F | 2 | B2384 | MG5111 SERIES | 4-30-87 MCB JS BCA |
| XA7372K | A7361B | B1337F 1 | B1397C | .060 .064 | M2051CD | YES | | | XA2707CB | OUTER A2707BV | CENTER/INNER A2704CW/A2702BW | 230 | M2089P | 2 | M2089F | 2 | B2384 | MG511 SERIES W/P.T.O. | 7-28-89 MCB JS BCA |
| XA7372L | A7361B | B1337F 1 | B1397C | .060 .064 | M2051CD | YES | | | XA2707CB | OUTER A2707BV | CENTER/INNER A2704CW/A2702BW | 230 | M2089AR | 2 | M2089AR | 2 | B2464 | MG5141 | 9-4-90 RCB BCA |
| XA7372M | A7361B | B1337F 1 | B1397F | .090 .096 | 3/4-14 M2702D ▼ | NO | | | XA2707CE | OUTER A2707BX | CENTER/INNER A2704CW/A2702BW | 230 | M2089F | 2 | M2089F | 2 | B2384 | MG5090 SERIES | 11-12-90 MCB JS BCA |
| XA7372N | A7361B | B1337D 1 | B1397C | .060 .064 | M2052AA M2051L | NO | | | XA2707CA | A2707BX | A2705AT | 200 | M2089F | 2 | M2089F | 2 | B2464 | MG518-1 | 7-15-91 JS BCA |
| XA7372P | A7361B | B1337F 1 | B1397F | .090 .096 | 3/4-14 M2702D ▼ | NO | | | PX10501 | OUTER P102411 | CENTER/INNER A2704CW/P10501 | 250 | M2089F | 2 | M2089F | 2 | B2384 | MG5090A | 1-18-93 JS TBC |
| XA7372Q | A7361B | B1337F 1 | B1397C | .060 .064 | 3/4-14 M2051CD | YES | | | XA2707CB | OUTER A2707BV | CENTER/INNER A2704CW/A2702BW | 230 | M2089F | 2 | M2089F | 2 | B2464 | MG5182 | 4-8-93 KS TBC |
| XA7372R | A7361B | B1337F 1 | B1397C | .060 .064 | M2051CD | YES | | | XA2707CG | OUTER A2707BY | CENTER/INNER A2704CW/A2702BW | 250 | M2089AR | 2 | M2089AR | 2 | B2464 | MG5141 | 9-12-95 JS TBC |
| XA7372S | A7361B | B1337F 1 | B1397F | .090 .096 | 3/4-14 M2702D ▼ | NO | | | PX10501 | OUTER P102411 | CENTER/INNER A2704/P10501 | 270 | M2089F | 2 | M2089F | 2 | B2384 | MG5190A MG5191SC | 5-29-96 BAS VTV |
| XA7372T | A7361B | B1337D 1 | B1397C | .060 .064 | M2051CD | YES | | | XA2707CF | OUTER A2707BX | CENTER/INNER A2707BV/A2704CW/A2702BW | 250 | M2089Y | 1 | M2089F | 3 | B2464 | MG-5170DC | 7-10-97 ALC BAS |



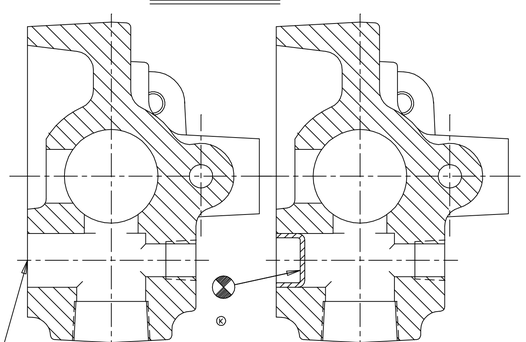




SECTION A-A




SECTION C-C



SECTION G-G

A7361B VALVE BODY AS USED FOR FACE-PORTED VALVE INLET HERE.



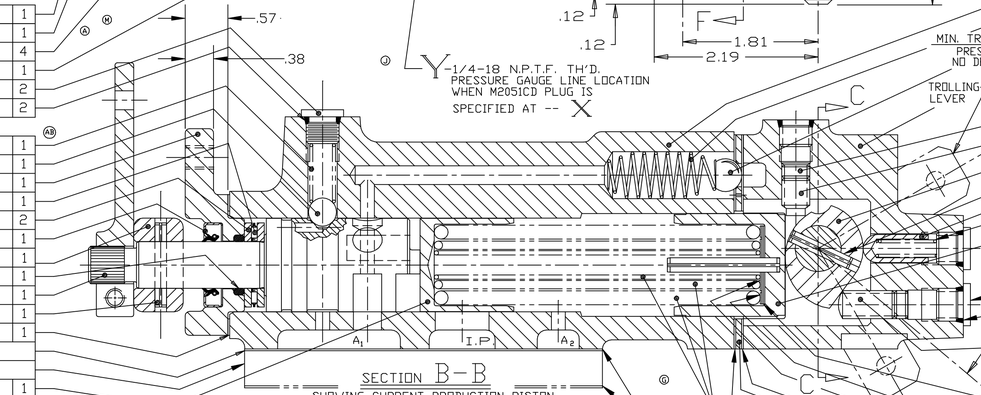
SECTION G-G

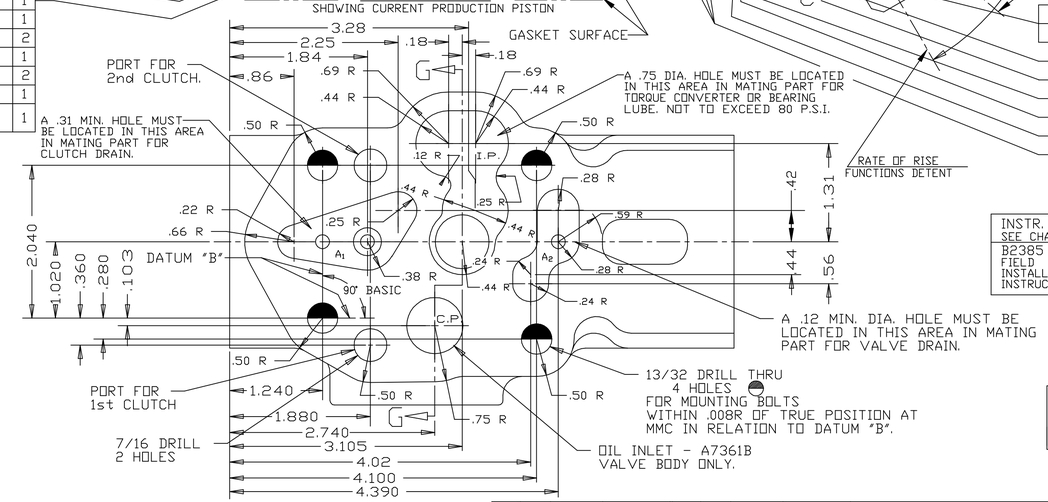
XA7361B VALVE BODY AS USED FOR HOSE INLET THRU PORT X

XA7361B CONSISTS OF: A7361B VALVE BODY AND M1945AC ⊗ CORE PLUG.

| | |
|---|---|
| 204087 | 1 |
| M1731AF | 1 |
| M2001M | 4 |
| M2051K | 1 |
| M2782C | 2 |
| A2916DK | 2 |

| | |
|---|---|
| 201341QP | 1 |
| M1990E | 1 |
| B3574A | 1 |
| M2087K | 1 |
| M2086AV | 2 |
| MA778 | 1 |
| B1867 | 1 |
| A2916AT | 1 |
| A4347J | 1 |
| M1927B | 1 |
| B1334A | 1 |
| SEE CHART | |
| ■ SEE CHART | |
| B1400B | 1 |
| B2103 | 1 |
| A2916DD | 2 |
| B2452A | 1 |
| MA778 | 2 |
| M2000H | 1 |
| M2027C HEX NUT | 1 |




| | |
|---|---|
| M2001BP | 4 |
| SEE CHART | |
| M2067X | 4 |
| SEE CHART | |
| SEE CHART | 1 |
| A2703P | 1 |
| M1990H | 1 |
| XB6117A | 1 |
| B6117A | 1 * |
| M1900B STEEL BALL | 3 |

SEE NOTE #4

| | |
|---|---|
| A2870K | 2 |
| M2038AD | 1 |
| B6115A | 1 |
| M1927AF | 1 |
| B1139 | 1 |
| A2700AB | 1 |
| XB1399G | 1 |
| B1399G | 1 * |
| M1927ED | 1 * |
| M2782C | 3 |
| A2916DK | 3 |
| M2042N | 1 |

SEE NOTE #8

SEE NOTE #9

| | |
|---|---|
| B2451 | ADJUSTS CONTROL AND TROLLING PRESSURE |
| B2451A | |
| B2451B | ADJUSTS TROLLING PRESSURE |
| B2465B | ADJUSTS CONTROL PRESSURE |
| B2465C | |
| B1398E | 1 |
| SEE CHART | 1 ▲ |
| B1398E | 1 |
| SEE CHART | 1 ⊘ |

AS REQUIRED

| | |
|---|---|
| INSTR. PLATE SEE CHART | 1 ◉ |
| B2385 FIELD INSTALLATION INSTRUCTIONS | 1 ◉ |

USE FOR SERVICE
REPLACED BY XA7600A
FOR PRODUCTION

TEST VALVES PER TEST SPEC. NO.
CONTAINED IN VALVE BILL OF MATERIAL

INSTALLATION DATA:

1.) VALVE SUITABLE FOR UP TO 25 G.P.M.

2.) CLUTCH PRESSURE IN NEUTRAL WILL BE BETWEEN 30 AND 90 P.S.I. DEPENDING UPON SPRING ASS'Y. USED, G.P.M. THRU VALVE AND INTERMEDIATE PRESSURE.

AB 3.) CONTROL VALVE REQUIRES 4-14 lbf AT THE 2.20R LOCATION OF THE 1/4 DIA. HOLE TO OVERCOME DETENT EFFORT. REMOTE CONTROL VALVE ACTUATOR MUST PROVIDE ±1.41 LINEAR TRAVEL FROM NEUTRAL AT THE 1/4 DIA. HOLE LOCATION. (WHEN SUITABLE REMOTE CONTROLS ARE USED, THE DETENT SPRINGS AND BALL MAY BE OMITTED, THEN THE FORCE WILL BECOME 3-7 LBS.) THE DETENT FEATURE IS PROVIDED IN THE FULL 1st CLUTCH ENGAGED, FULL 2nd CLUTCH ENGAGED AND NEUTRAL LEVER POSITIONS.

E 4.) TORQUE MOUNTING BOLTS TO 30-36 LB.-FT., "AS RECEIVED" (PER S574) OR 25-29 LB.-FT., "LUBRICATED" (PER S574). AFTER TORQUING MOUNTING BOLTS, INSTALL M2026Q PLUGS IN MOUNTING BOLT COUNTERBORES.

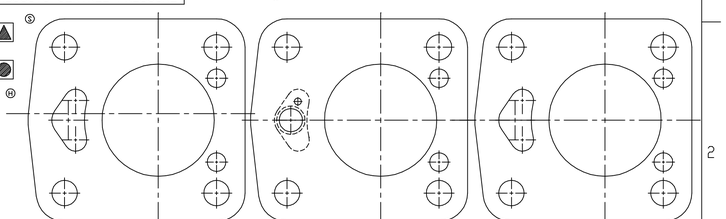
5.) TROLLING VALVE REQUIRES 20-35 LBS. AT THE 1.81R LOCATION OF THE 1/4 DIA. HOLE TO OVERCOME DETENT EFFORT. REMOTE CONTROL VALVE ACTUATOR MUST PROVIDE ±2.56 LINEAR TRAVEL FROM DETENT AT THE 1/4 DIA. HOLE LOCATION. THE DETENT FEATURE IS PROVIDED IN THE RATE OR RISE POSITION ONLY.

G 6.) CONTROL HEAD FOR TROLLING VALVE MUST INCLUDE A DEVICE TO LOCK TROLLING VALVE CONTROL LEVER IN THE DETENTED NO-TROLL POSITION DURING MANEUVERING, DOCKING AND OTHER OPERATING CONDITIONS THAT REQUIRE FULL POWER TO THE PROPELLER.

A 7.) INSTALL EACH "O"-RING FROM ITS RESPECTIVE SIDE OF TROLLING VALVE COVER, DO NOT PASS "O"-RINGS THROUGH CENTRAL CAM SLOT OF COVER. INSTALL "O"-RINGS AFTER CAM AND CAM SHAFT ARE PLACED INTO COVER BUT PRIOR TO INSTALLING CAM ROLL PIN.

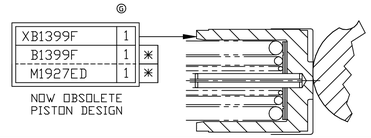
8.) THIS SETSCREW IS USED TO INSURE THAT THE TROLLING CAM DOES NOT TRAVEL BEYOND DETENTED POSITION. TO INSTALL, ROTATE TROLLING LEVER FROM THE TROLLING RANGE INTO DETENT POSITION, THEN WHILE APPLYING SLIGHT REVERSE PRESSURE AGAINST THE DETENT, ADVANCE SETSCREW AGAINST CAM, BACK IT OUT 1/4 TURN, THEN LOCK IN PLACE WITH LOCKSCREW.

9.) THIS SETSCREW IS USED TO ADJUST THE MINIMUM TROLLING PRESSURE. REFER TO TEST SPECIFICATION FOR ADJUSTMENT PROCEDURE. THIS ADJUSTMENT SHOULD ONLY BE MADE AFTER THE DETENT PLUNGER AND DETENT OVERTRAVEL SETSCREW HAVE BEEN INSTALLED PER NOTE #8.




| | |
|---|---|
| XB1399F | 1 |
| B1399F | 1 * |
| M1927ED | 1 * |

NOW OBSOLETE PISTON DESIGN



◉ THESE PARTS ARE TO BE PACKAGED SEPARATELY AND SHIPPED WITH UNIT.

* NOT SERVICEABLE SEPARATELY.

▼ REMOVE BEFORE OPERATING UNIT, ALUMINUM THREAD PROTECTOR. ⊗

$A_1$ = ATMOSPHERIC PRESSURE
$A_2$ = ATMOSPHERIC PRESSURE
I.P. = INTERMEDIATE PRESSURE
C.P. = CLUTCH PRESSURE

| REV | ZONE | CH. NO. | DATE | REV | ZONE | CH. NO. | DATE |
|---|---|---|---|---|---|---|---|
| AB | E-4 | 28958 | 1-21-99 | | | | |
| AA | C-6 | 27552 | 2-20-97 | | | | |
| Z | C-6 | 27566 | 2-20-97 | | | | |
| Y | B-4 | 26182 | 8-21-95 | | | | |
| X | A1 | 24804 | 12-7-94 | | | | |
| W | E-4 | 24983 | 5-16-94 | | | | |

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MATERIAL: --------
HEAT TREAT: --------
SURFACE TREATMENT:
WEIGHT: LBS. | WR²: LBS. IN²
FIRST USE
ASSY. SEE CHART
MODEL
NAME: VALVE ASS'Y.-CONTROL & TROLLING

UNLESS OTHERWISE SPECIFIED
MACHINED DIMENSIONS X.X ±0.030 X.XX ±0.010 X.XXX ±0.005
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 8-24-90
SCALE 1.00 "=1"
DRN. KS
CHK. REB JS
APPD. BCA

THIRD ANGLE PROJECTION
SIMILAR TO XA7362 SERIES

TWIN DISC INCORPORATED
RACINE, WI 53403 - USA

XA7372 SERIES

SHEET 1 OF 1 REV AB

File name: XA7372

| VALVE ASSEMBLY NUMBER | VALVE BODY (SEE SECT. C-C) | VALVE BODY GASKET PART NO. QTY. | ORIFICE PLATE PART NO. | ORIFICE PLATE SIZE | X | VALVE SPRINGS ● SPRING ASS'Y. | VALVE SPRINGS ● CONSISTS OF: OUTER | VALVE SPRINGS ● CONSISTS OF: CENTER | VALVE SPRINGS ● CONSISTS OF: INNER | CLUTCH kPa NOM. | SHIMS ⬡ PART NO. | SHIMS ⬡ QTY | SOCKET HD. SCREWS ⊗ | QTY | SOCKET HD. SCREWS ▽ | QTY | FIRST USE | DATE AND APPR. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XA7540 | 1001138 | B1337D 1 | B1397D | 1.20 1.32 | M27 X 2 MA1038E | -------- | OUTER A2707BD | CENTER A2704BU | INNER A2702BC | 1725 | B2334 | USE AS REQUIRED | MA1052A | 2 | MA1052A | 2 | MG5202<DC> | 9-17-93 DAS/TBC |
| XA7540A | 1001138 | B1337D 1 | B1397D | 1.20 1.32 | M27 X 2 MA1038E | XA2707AX | A2707AX | A2704BU | | 1585 | B2334 | | MA1052B | 2 | MA1052B | 2 | MG5202<SC> | 1-14-94 DAS/TBC |
| XA7540B | 1001138 | B1337D 1 | B1397D | 1.20 1.32 | M27 X 2 MA1038E | -------- | OUTER A2707BD | CENTER A2704BU | INNER A2702BC | 1725 | B2334 | | MA1052L | 2 | MA1052L | 2 | MG5202<SC> P.T.O. | 1-4-95 DAS/TBC |
| XA7540C | 1001138 | B1337D 1 | B1397D | 1.20 1.32 | M27 X 2 MA1038E | -------- | OUTER A2707BD | CENTER A2704BU | INNER A2702BC | 1725 | B2334 | | MA1052N | 2 | MA1052N | 2 | MG5204<SC> | 9-1-95 DAS |

1st CLUTCH ENGAGED, FOR 3 POSITION (FWD.-NEU.-REV.) USE.
ENGAGED, FOR 2 POSITION (ENGAGED & DISENGAGED) USE.

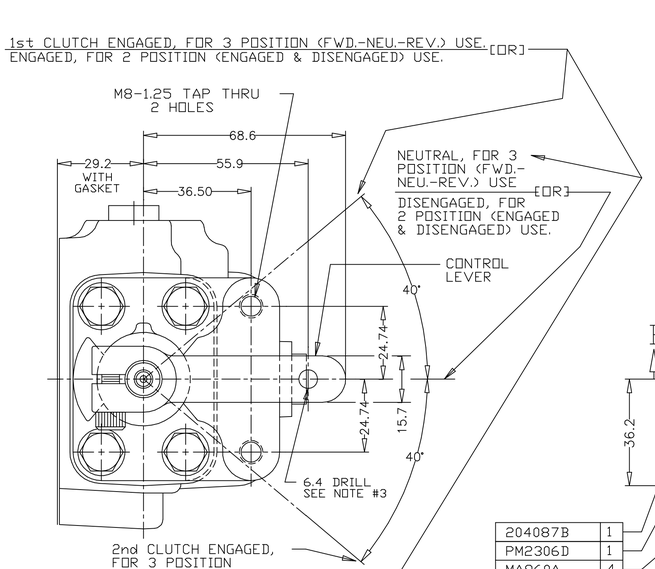
[OR]

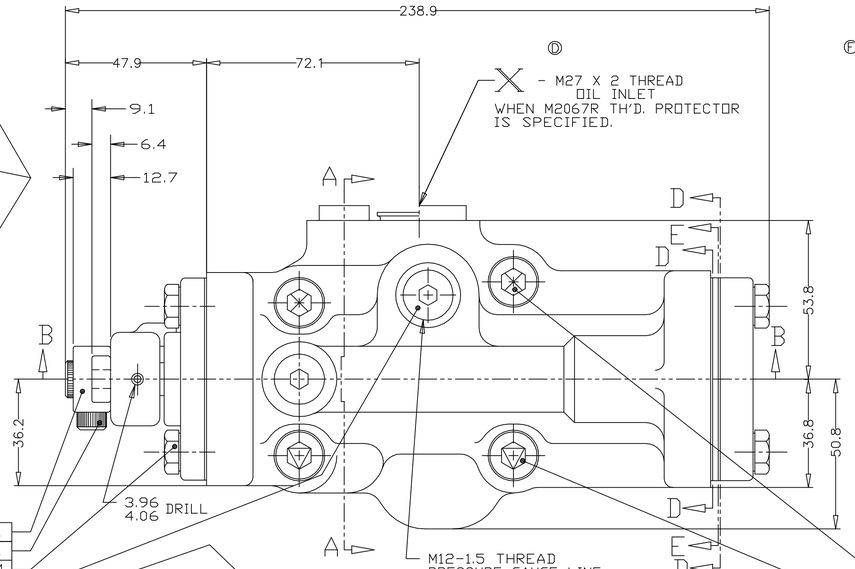
NEUTRAL, FOR 3 POSITION (FWD.-NEU.-REV.) USE

[OR]

DISENGAGED, FOR 2 POSITION (ENGAGED & DISENGAGED) USE.

2nd CLUTCH ENGAGED, FOR 3 POSITION (FWD.-NEU.-REV.) USE.




| | |
|---|---|
| 204087B | 1 |
| PM2306D | 1 |
| MA960A | 4 |
| MA1038B | 1 |
| MA1038B | 2 |

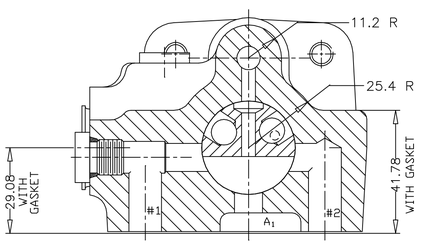
| | |
|---|---|
| 201341QP | 1 |
| M1990E | 1 |
| B3574C | 1 |
| M2087K | 2 |
| M2086AV | 2 |
| MA778 | 1 |
| B1867 3 POSITION | 1 |
| B2297A 2 POSITION | 1 |
| A2916AT | 1 |

| | |
|---|---|
| A4347J | 1 |
| M1927B | 1 |
| B1334A | 1 |
| SEE CHART | |

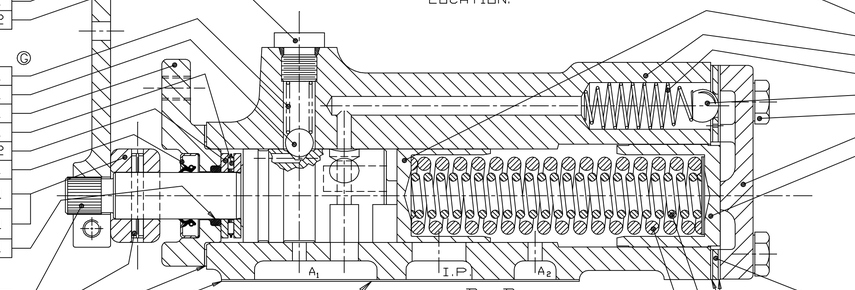
| | |
|---|---|
| SEE CHART | |
| M2067X | 4 |
| SEE CHART | |
| B1400B | 1 |
| SEE CHART | 1 |
| A2703P | 1 |
| M1990H | 1 |
| MA960A | 4 |
| B1333D | 1 |
| B1399C | 1 |

SEE NOTE #4

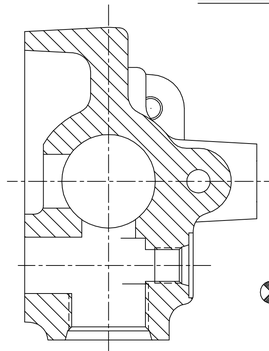
| | |
|---|---|
| SEE CHART | 1 ▲ |
| B1398E | 2 |
| SEE CHART | ⬡ |
| SEE CHART | 1 ● |




SECTION A-A

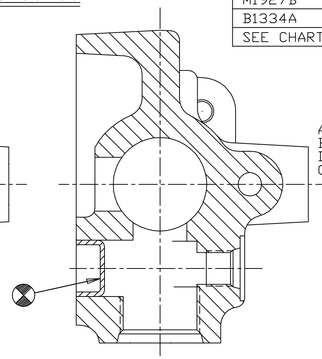



SECTION B-B



SECTION C-C

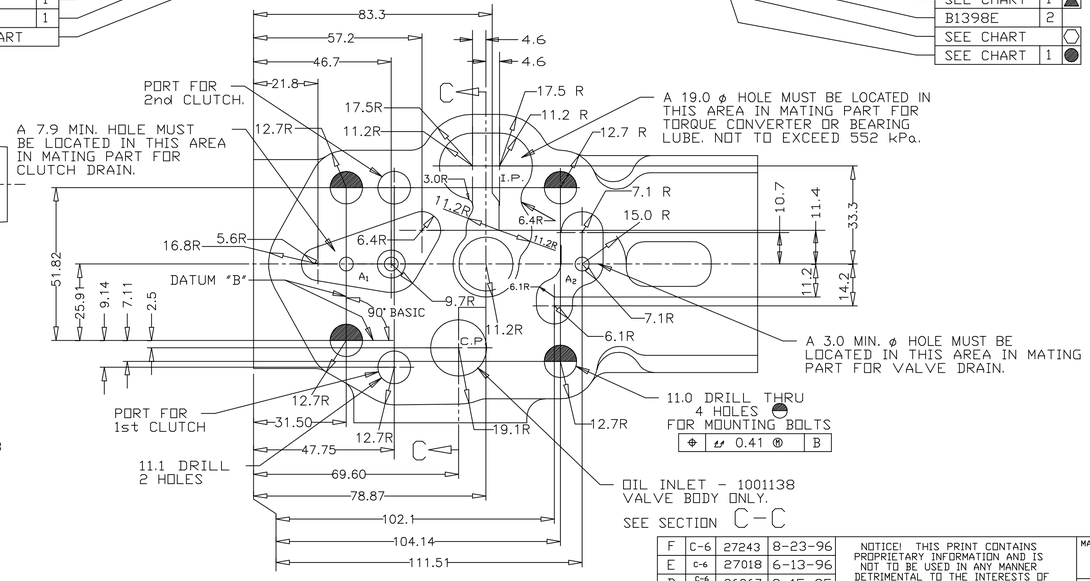
1001138 VALVE BODY AS USED FOR FACE-PORTED VALVE INLET HERE.

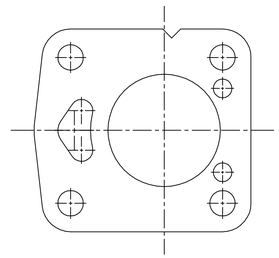


SECTION C-C

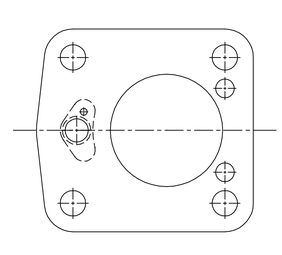
------- VALVE BODY AS USED FOR HOSE INLET THRU PORT ⊗

------- CONSISTS OF: 1001138 VALVE BODY AND M1945AC ⊗ CORE PLUG.



SECTION D-D
GASKET



SECTION E-E
ORIFICE PLATE

## TEST VALVES PER TEST SPEC. NO. CONTAINED IN VALVE SPECIFICATION

INSTALLATION DATA:

1.) VALVE SUITABLE FOR UP TO 95 L/min.

2.) CLUTCH PRESSURE IN NEUTRAL WILL BE BETWEEN 207 AND 621 kPa DEPENDING UPON SPRING ASS'Y. USED, L/min THRU VALVE AND INTERMEDIATE PRESSURE.

3.) 18-62 N AT THE 55.9 R LOCATION OF THE 6.4 ϕ HOLE IS REQUIRED TO OVERCOME DETENT EFFORT. REMOTE CONTROL VALVE ACTUATOR MUST PROVIDE ±35.8 LINEAR TRAVEL FROM NEUTRAL AT THE 6.4 ϕ HOLE LOCATION. (WHEN SUITABLE REMOTE CONTROLS ARE USED, THE DETENT SPRING AND PIN MAY BE OMITTED, THEN THE FORCE WILL BECOME 13-31 N) THE DETENT FEATURE IS PROVIDED IN THE FULL FORWARD, FULL REVERSE AND NEUTRAL LEVER POSITIONS.

4.) TORQUE MOUNTING BOLTS TO 41-49 N·m, "AS RECEIVED" (PER S574) OR 34-39 N·m, "LUBRICATED" (PER S574). AFTER TORQUING MOUNTING BOLTS, INSTALL M2067Q PLUGS IN MOUNTING BOLT COUNTERBORES.

GENERAL NOTES:

▼ REMOVE BEFORE OPERATING UNIT.

$A_1$ = ATMOSPHERIC PRESSURE
$A_2$ = ATMOSPHERIC PRESSURE
I.P. = INTERMEDIATE PRESSURE
C.P. = CLUTCH PRESSURE

| REV | ZONE | CH. NO. | DATE |
|---|---|---|---|
| F | C-6 | 27243 | 8-23-96 |
| E | C-6 | 27018 | 6-13-96 |
| D | C-6 B-6 | 26267 | 8-15-95 |
| C | B-6 | 26246 | 8-1-95 |
| B | B-4 | 24983 | 5-16-94 |
| A | B-6 | 24635 | 11-3-93 |
| G | E-4 | 28958 | 1-21-99 |

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MATERIAL: -------
HEAT TREAT: -------
SURFACE TREATMENT:
WEIGHT: kg  WR²: N m²
FIRST USE
ASSY. MODEL: SEE CHART
NAME: VALVE ASS'Y.-CONTROL

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X. ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 9-17-93
SCALE 1=1mm
DRN. AZ
CHK. DAS
APPD. TBC

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO XA7371 SERIES

TWIN DISC INCORPORATED RACINE, WI 53403 - USA
XA7540 SERIES
SHEET 1 OF 1 REV G

| | VALVE ASSEMBLY NUMBER | VALVE BODY (SEE SECT. G-G) | VALVE BODY GASKET PART NO. QTY. | ORIFICE PLATE PART NO. | ORIFICE PLATE SIZE | X | VALVE SPRINGS SPRING ASS'Y. | VALVE SPRINGS CONSISTS OF: OUTER | MIDDLE | INNER | CLUTCH kPa NOM. | SOCKET HD. SCREWS ⊗ | QTY | ▽ | QTY | INSTR PLATE NO. ⊙ | FIRST USE | DATE AND APPR. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ⓑ | XA7600 | 1001138 | B1337D 1 | B1397C | 1.58 1.63 | M27-1.5 MA1038E | ----- | A2707BX | A2705AT | A2702BC | 1725 | MA1052A | 2 | MA1052A | 2 | B2464 | MG5202<DC> | 2-8-94 TBC |
| Ⓒ | XA7600A | 1001138 | B1337D 1 | B1397C | 1.58 1.63 | M27-1.5 MA1038E | XA2707CB | A2707BV | A2704CW | A2702BW | 1585 | MA1052B | 2 | MA1052B | 2 | B2464 | MG5202<SC> | 2-8-94 TBC |
| Ⓒ | XA7600B | 1001138 | B1337D 1 | B1397C | 1.58 1.63 | M27-1.5 MA1038E | ----- | A2707BX | A2705AT | A2702BC | 1725 | MA1052N | 2 | MA1052N | 2 | B2464 | MG5204 | 3-26-96 DAS |

# TEST VALVES PER TEST SPEC. NO. CONTAINED IN VALVE SPECIFICATION

## INSTALLATION DATA:

1.) VALVE SUITABLE FOR UP TO 95 L/min.

2.) CLUTCH PRESSURE IN NEUTRAL WILL BE BETWEEN 207 AND 621 kPa DEPENDING UPON SPRING ASS'Y. USED, L/min THRU VALVE AND INTERMEDIATE PRESSURE.

Ⓓ 3.) 18–62 N AT THE 55.9 R LOCATION OF THE 6.4 ø HOLE IS REQUIRED TO OVERCOME DETENT EFFORT. REMOTE CONTROL VALVE ACTUATOR MUST PROVIDE ±35.8 LINEAR TRAVEL FROM NEUTRAL AT THE 6.4 ø HOLE LOCATION. (WHEN SUITABLE REMOTE CONTROLS ARE USED, THE DETENT SPRING AND PIN MAY BE OMITTED, THEN THE FORCE WILL BECOME 13–31 N) THE DETENT FEATURE IS PROVIDED IN THE FULL FORWARD, FULL REVERSE AND NEUTRAL LEVER POSITIONS.

4.) TORQUE MOUNTING BOLTS TO 41–49 N·m, "AS RECEIVED" (PER S574) OR 34–39 N·m, "LUBRICATED" (PER S574). AFTER TORQUING MOUNTING BOLTS, INSTALL M2067Q PLUGS IN MOUNTING BOLT COUNTERBORES.

5.) TROLLING VALVE REQUIRES 89–156 N AT THE 46.0 R LOCATION OF THE 6.4 ø HOLE TO OVERCOME DETENT EFFORT. REMOTE CONTROL VALVE ACTUATOR MUST PROVIDE ±65.0 LINEAR TRAVEL FROM DETENT AT THE 6.4 ø HOLE LOCATION. THE DETENT FEATURE IS PROVIDED IN THE RATE OF RISE POSITION ONLY.

6.) CONTROL HEAD FOR TROLLING VALVE MUST INCLUDE A DEVICE TO LOCK TROLLING VALVE CONTROL LEVER IN THE DETENTED NO-TROLL POSITION DURING MANEUVERING, DOCKING AND OTHER OPERATING CONDITIONS THAT REQUIRE FULL POWER TO THE PROPELLER.

7.) INSTALL EACH "O"-RING FROM ITS RESPECTIVE SIDE OF TROLLING VALVE COVER, DO NOT PASS "O"-RINGS THROUGH CENTRAL CAM SLOT OF COVER. INSTALL "O"-RINGS AFTER CAM AND CAM SHAFT ARE PLACED INTO COVER BUT PRIOR TO INSTALLING CAM ROLL PIN.

8.) THIS SETSCREW IS USED TO INSURE THAT THE TROLLING CAM DOES NOT TRAVEL BEYOND DETENTED POSITION. TO INSTALL, ROTATE TROLLING LEVER FROM THE TROLLING RANGE INTO DETENTED POSITION, THEN WHILE APPLYING SLIGHT REVERSE PRESSURE AGAINST THE DETENT, ADVANCE SETSCREW AGAINST CAM, BACK IT OUT A QUARTER TURN, THEN LOCK IN PLACE WITH LOCKSCREW.

9.) THIS SETSCREW IS USED TO ADJUST THE MINIMUM TROLLING PRESSURE. REFER TO TEST SPECIFICATION FOR ADJUSTMENT PROCEDURE. THIS ADJUSTMENT SHOULD ONLY BE MADE AFTER THE DETENT PLUNGER AND DETENT OVERTRAVEL SETSCREW HAVE BEEN INSTALLED PER NOTE #8.

| | |
|---|---|
| 204087B | 1 |
| PM2306D | 1 |
| MA960A | 4 |
| MA1038B | 1 |
| MA1038B | 2 |

| | |
|---|---|
| 201341QP | 1 |
| M1990E | 1 |
| B3574C | 1 |
| M2087K | 1 |
| M2086AV | 2 |
| MA778 | 1 |
| B1867 3 POSITION | 1 |
| B2297A 2 POSITION | 1 |
| A2916AT | 1 |

| | |
|---|---|
| A4347J | 1 |
| M1927B | 1 |
| B1334A | 1 |
| SEE CHART | |
| B2103 | 1 |
| M2000H | 1 |
| M2027C HEX. NUT | 1 |
| MA778 | 2 |
| A2916DD | 2 |
| B2452A | 1 |

| | | |
|---|---|---|
| INSTR. PLATE SEE CHART | 1 | ⊙ |
| B2385 FIELD INSTALLATION INSTRUCTIONS | 1 | ⊙ |

| | |
|---|---|
| MA960F | 4 |
| SEE CHART | |
| M2067X | 4 |
| SEE CHART | |
| SEE CHART | 1 |
| A2703P | 1 |
| M1990H | 1 |

SEE NOTE #4

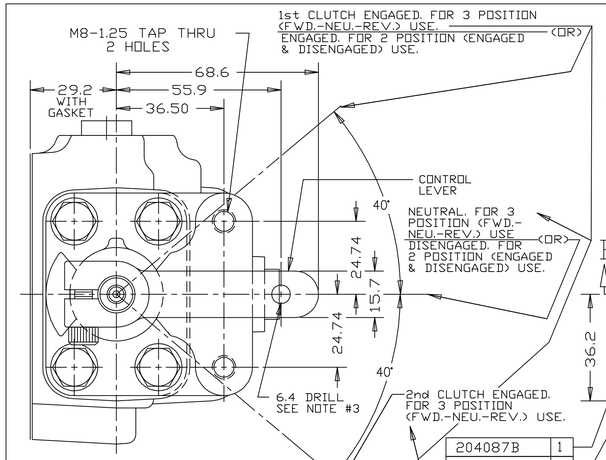
| | | |
|---|---|---|
| XB6117B | 1 | |
| B6117B | 1 | * |
| M1990B STEEL BALL | 3 | |
| M2038AD | 1 | |
| B1139 | 1 | |
| A2700AB | 1 | |
| B6115A | 1 | |
| M1927AF | 1 | |
| MA1038B | 3 | |
| A2870K | 2 | |
| M2042N | 1 | |

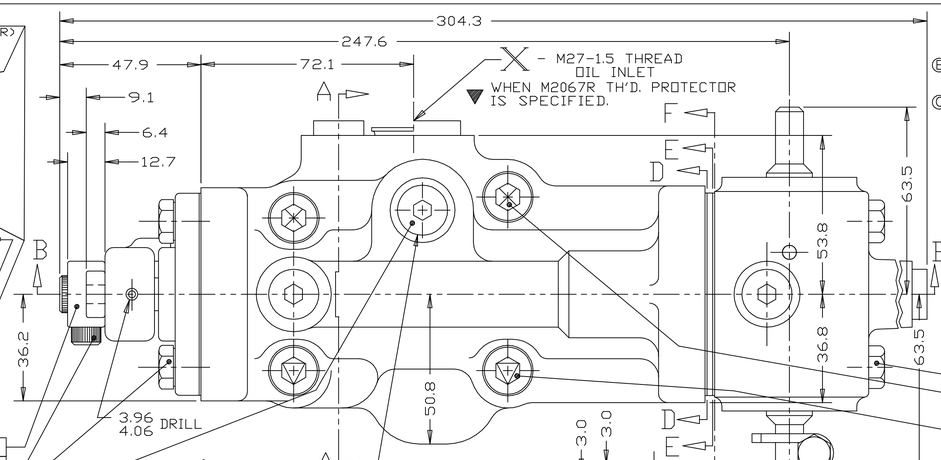
SEE NOTE #8

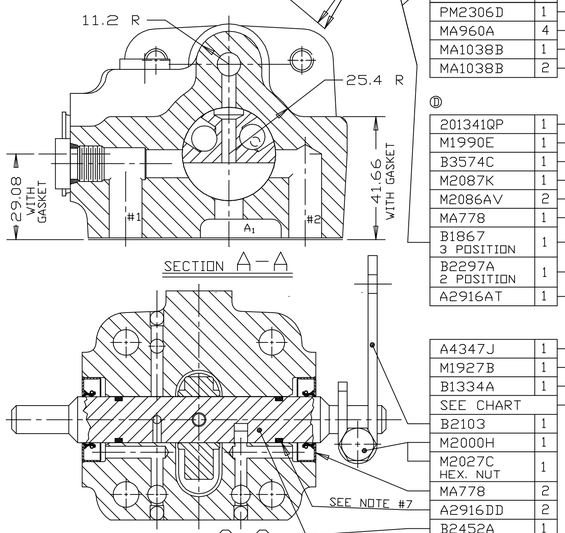
| | | |
|---|---|---|
| XB1399G | 1 | |
| B1399G | 1 | * |
| M1927ED | 1 | * |
| SEE CHART | 1 | ● |
| SEE CHART | 1 | ▲ |
| B1398E | 2 | |
| B1400B | 1 | |

| | | |
|---|---|---|
| B2451 | AS REQ'D. | ADJUSTS CONTROL AND TROLLING PRESSURE |
| B2451A | | |
| B2451B | | |
| B2465B | | ADJUSTS TROLLING PRESSURE |
| B2465C | | ADJUSTS CONTROL PRESSURE |

SEE NOTE #9

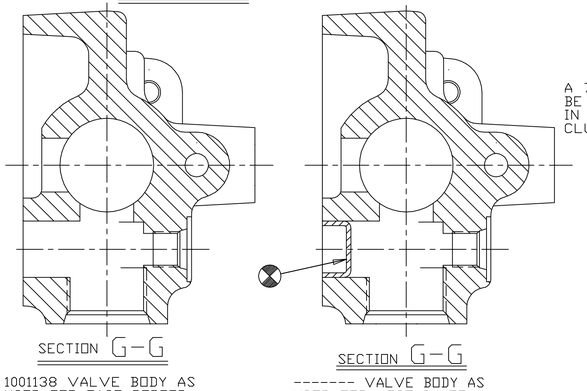

M8-1.25 TAP THRU 2 HOLES
1st CLUTCH ENGAGED. FOR 3 POSITION (F.W.D.-NEU.-REV.) USE. (OR) ENGAGED. FOR 2 POSITION (ENGAGED & DISENGAGED) USE.
68.6
55.9
36.50
29.2 WITH GASKET
CONTROL LEVER
40°
NEUTRAL. FOR 3 POSITION (F.W.D.-NEU.-REV.) USE (OR) DISENGAGED. FOR 2 POSITION (ENGAGED & DISENGAGED) USE.
24.74
15.7
24.74
40°
6.4 DRILL SEE NOTE #3
2nd CLUTCH ENGAGED. FOR 3 POSITION (F.W.D.-NEU.-REV.) USE.

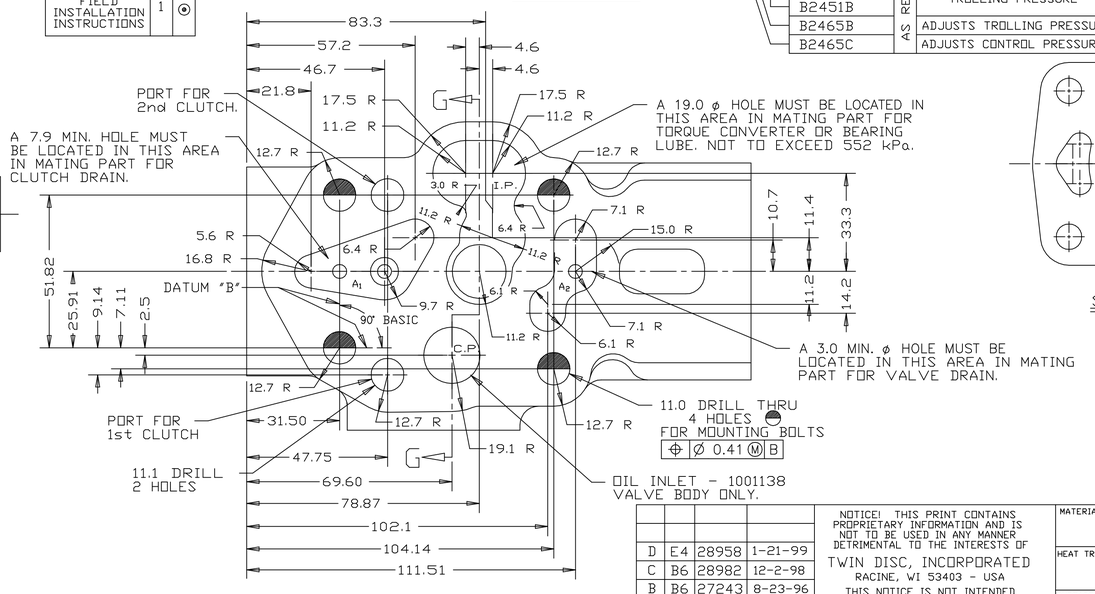


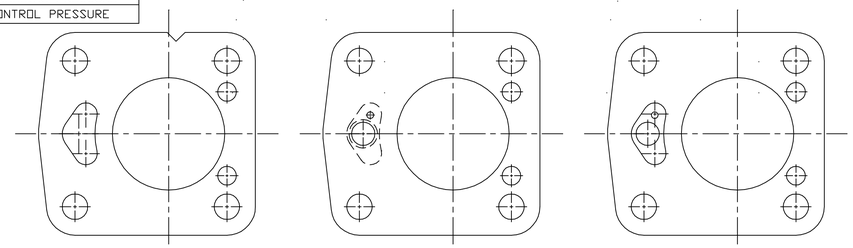








SECTION G-G
1001138 VALVE BODY AS USED FOR FACE-PORTED VALVE INLET HERE.
SECTION G-G
------- VALVE BODY AS USED FOR HOSE INLET THRU PORT X
------- CONSISTS OF: 1001138 VALVE BODY AND M1945AC ⊗ CORE PLUG.




## GENERAL NOTES:

▼ REMOVE BEFORE OPERATING UNIT, THREAD PROTECTOR

✳ NOT SERVICEABLE SEPARATELY.

◉ THESES PARTS ARE TO BE PACKAGED SEPARATELY AND SHIPPED WITH UNIT.

A1 = ATMOSPHERIC PRESSURE
A2 = ATMOSPHERIC PRESSURE
I.P. = INTERMEDIATE PRESSURE
C.P. = CLUTCH PRESSURE

| REV. | ZONE | CH. NO. | DATE |
|---|---|---|---|
| D | E4 | 28958 | 1-21-99 |
| C | B6 | 28982 | 12-2-98 |
| B | B6 | 27243 | 8-23-96 |
| A | B5 | 24983 | 5-16-94 |

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| | | | |
|---|---|---|---|
| MATERIAL | ---------- | WEIGHT LBS. | WR² LBS. IN² |
| HEAT TREAT | ---------- | FIRST USE ASSY. | SEE CHART |
| | | MODEL | |
| SURFACE TREATMENT | ---------- | NAME | VALVE ASS'Y.-CONTROL & TROLLING |

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE m
MACHINED DIMENSIONS
X. ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

| | |
|---|---|
| DATE | 2-7-94 |
| SCALE | 1=1mm |
| DRN. | KS |
| CHK. | JS DAS |
| APPD. | TBC |

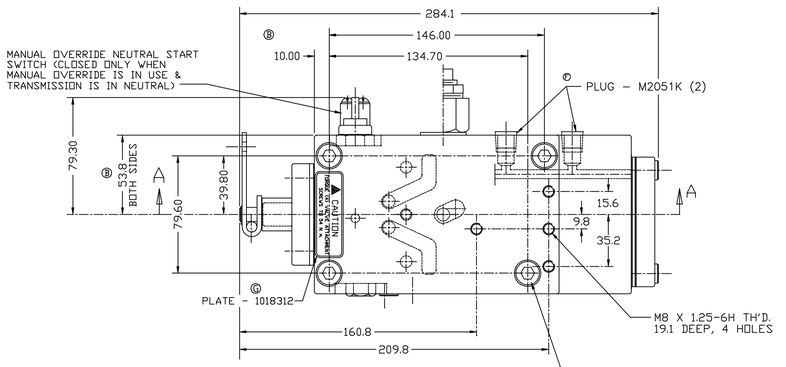
METRIC
THIRD ANGLE PROJECTION
SIMILAR TO XA7372 SERIES

TWIN DISC INCORPORATED
RACINE, WI 53403 - USA

XA7600 SERIES

SHEET 1 OF 1 REV D

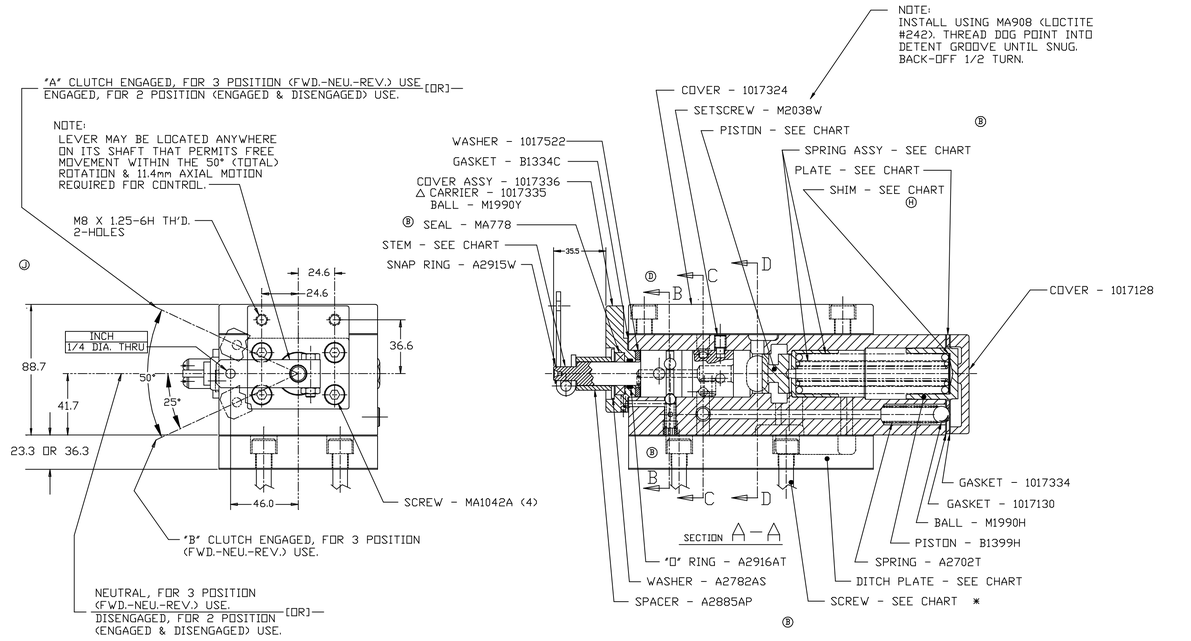
file name: XA7600

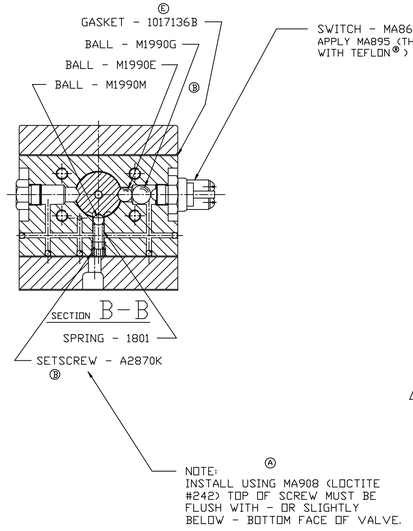


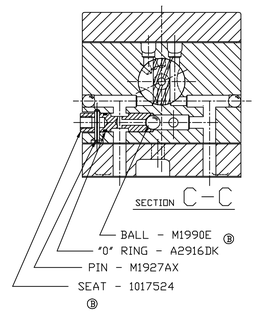

Ⓑ TOP VIEW

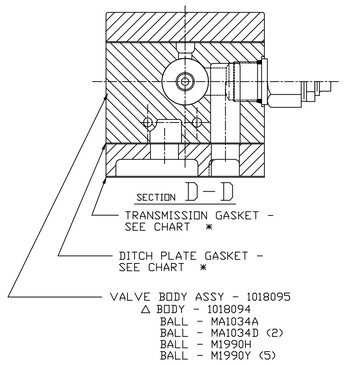
| VALVE ASS'Y No. | BOM No. | DITCH PLATE No. | DITCH PLATE GASKET | TRANSMISSION GASKET | STEM | PISTON | VALVE SPRINGS | | | CLUTCH kPa (PSI) NOM. | ORIFICE PLATE No. | X | SHIMS | | MOUNTING SCREWS | | | | FIRST USE | DATE AND APPR. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SPRING ASS'Y | CONSISTS OF : OUTER | CONSISTS OF : INNER | | | | PART NO. | QTY. | "R" ✱ | QTY. | "S" ✱ | QTY. | | | |
| 1017172 | 40770 | 1017133 | 1017134 | B1337F | 1018163 | 1018688 | XA2707Z | A2707Z | A2703T | 1725 (250) NOM. | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | AS REQUIRED | MA1052A | 2 | MA1052A | 2 | MG-5202DC | 3-17-98 DAS/BJE | Ⓑ |
| 1017172A | 40772 | ------ | 1017383 | ------ | 1018163 | 1017179 | ------ | A2707BD | A2704BU | 2415 (350) | 1017129A | MA1038E(M27 X 2.0-6H) | B2451B | | ------ | | ------ | | MG-6619-00-RV | 3-17-98 DAS/BJE | |
| 1017172B | NOT YET AVAILABLE | 1018584 | 1018594 | B3117A | 1018163 | 1018688 | XA2707Z | A2707Z | A2703T | 1725 (250) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | | M1732AH | 2 | M1732AH | 2 | MG-540 | 11-6-98 DAS/BJE | |
| 1017172C | 41183 | -------- | 1017383 | -------- | 1018163 | 1017179 | ------- | A2707BD A2702BC | A2704BU | 2655 (385) | 1017129A | MA1038E(M27 X 2.0-6H) | B2451B | | ------ | | ------ | | MG-6449 | 11-6-98 DAS/BJE | |
| 1017172D | NOT YET AVAILABLE | -------- | 1017383 | -------- | 1018163 | 1017179 | ------- | A2707AX A2702BC | A2704BU | 2550 (370) | 1017129A | MA1038E(M27 X 2.0-6H) | B2451B | 3 | ------ | | ------ | | MG-6557 | 11-6-98 DAS/BJE | |
| 1017172E | NOT YET AVAILABLE | ------- | 1017383 | ------- | 1018163 | 1017179 | ------- | A2707AX A2702BC | A2704BU | 2450 (355) | 1017129A | MA1038E(M27 X 2.0-6H) | B2451B | AS REQ. | ------ | | ------ | | MG-6600 MG-6619 | 11-6-98 DAS/BJE | |
| 1017172F | 41060 | 1018885 | 1018594A | 1018884 | 1018163A | 1019791 | XA2707AD | A2707AD | A2703AB | 2000 (290) | 1019786 | MA1038E(M27 X 2.0-6H) | B2451B | 2 | MA1052C | 2 | MA1052C | 2 | 1017820B HYDRAULIC PTD | 3-18-99 BJE/DAS | Ⓚ |
| 1017172G | 41074 | 1018914 | 1018594A | 1017974 | 1018163A | 1019791 | XA2707AD | A2707AD | A2703AB | 2000 (290) | 1019786 | MA1038E(M27 X 2.0-6H) | B2451B | 2 | MA1062Q | 2 | MA1062Q | 2 | 1017820C HYDRAULIC PTD | 4-15-99 BJE/DAS | Ⓚ |
| 1017172H | 41085 | 1017133 | 1017134 | B1337F | 1018163 | 1018688 | XA2707Z | A2707Z | A2703T | 1725 (250) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | AS REQ. | M2089F | 2 | M2089F | 2 | MG-5112V | 5-3-99 BJE/DAS | |
| 1017172J | 41100 | 1017133 | 1017134 | B1337F | 1018163 | 1018688 | XA2707Z | A2707Z | A2703T | 1860 (270) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | 2 | M2089F | 2 | M2089F | 2 | MG-5090A | 5-27-99 BJE/DAS | |
| 1017172K | 41136 | -------- | 1018594A | ------- | 1018163A | 1019791 | ------- | A2707AX A2702BC | A2704BU | 2415 (350) | 1019786 | MA1038E(M27 X 2.0-6H) | B2451B | AS REQ. | ------ | | ------ | | 1017820C HYDRAULIC PTD | 10-13-99 ALC/DAS | Ⓚ |
| 1017172L | | | | | | | | | | | | | | | | | | | | | |
| 1017172M | | | | | | | | | | | | | | | | | | | | | |
| 1017172N | | | | | | | | | | | | | | | | | | | | | |
| 1017172P | | | | | | | | | | | | | | | | | | | | | |
| 1017172Q | | | | | | | | | | | | | | | | | | | | | |
| 1017172R | | | | | | | | | | | | | | | | | | | | | |
| 1017172S | | | | | | | | | | | | | | | | | | | | | |
| 1017172T | | | | | | | | | | | | | | | | | | | | | |
| 1017172U | | | | | | | | | | | | | | | | | | | | | |
| 1017172V | | | | | | | | | | | | | | | | | | | | | |
| 1017172W | | | | | | | | | | | | | | | | | | | | | |
| 1017172X | | | | | | | | | | | | | | | | | | | | | |
| 1017172Y | | | | | | | | | | | | | | | | | | | | | |
| 1017172Z | | | | | | | | | | | | | | | | | | | | | |
| 1017172AA | | | | | | | | | | | | | | | | | | | | | |
| 1017172AB | | | | | | | | | | | | | | | | | | | | | |
| 1017172AC | | | | | | | | | | | | | | | | | | | | | |
| 1017172AD | | | | | | | | | | | | | | | | | | | | | |
| 1017172AE | | | | | | | | | | | | | | | | | | | | | |
| 1017172AF | | | | | | | | | | | | | | | | | | | | | |
| 1017172AG | | | | | | | | | | | | | | | | | | | | | |
| 1017172AH | | | | | | | | | | | | | | | | | | | | | |
| 1017172AJ | | | | | | | | | | | | | | | | | | | | | |
| 1017172AK | | | | | | | | | | | | | | | | | | | | | |

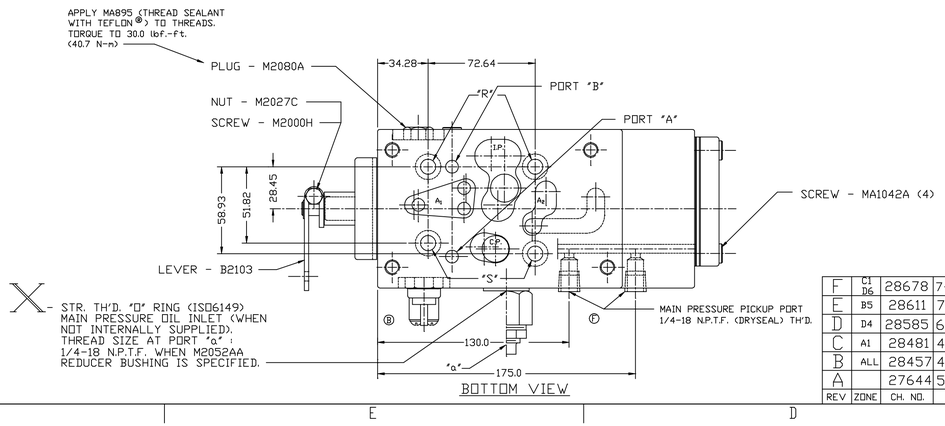
Ⓗ Ⓗ


"A" CLUTCH ENGAGED, FOR 3 POSITION (FWD.-NEU.-REV.) USE ENGAGED, FOR 2 POSITION (ENGAGED & DISENGAGED) USE. [OR]
NOTE: LEVER MAY BE LOCATED ANYWHERE ON ITS SHAFT THAT PERMITS FREE MOVEMENT WITHIN THE 50° (TOTAL) ROTATION & 11.4mm AXIAL MOTION REQUIRED FOR CONTROL.
M8 X 1.25-6H TH'D. 2-HOLES
24.6
24.6
INCH 1/4 DIA. THRU
36.6
88.7
50°
25°
41.7
23.3 OR 36.3
46.0
SCREW - MA1042A (4)
"B" CLUTCH ENGAGED, FOR 3 POSITION (FWD.-NEU.-REV.) USE.
NEUTRAL, FOR 3 POSITION (FWD.-NEU.-REV.) USE.
DISENGAGED, FOR 2 POSITION (ENGAGED & DISENGAGED) USE. [OR]
NOTE: INSTALL USING MA908 (LOCTITE #242). THREAD DOG POINT INTO DETENT GROOVE UNTIL SNUG. BACK-OFF 1/2 TURN.
COVER - 1017324
SETSCREW - M2038W
PISTON - SEE CHART
SPRING ASSY - SEE CHART
PLATE - SEE CHART
SHIM - SEE CHART
WASHER - 1017522
GASKET - B1334C
COVER ASSY - 1017336
△ CARRIER - 1017335
BALL - M1990Y
SEAL - MA778
STEM - SEE CHART
SNAP RING - A2915W
.355
COVER - 1017128
GASKET - 1017334
GASKET - 1017130
BALL - M1990H
PISTON - B1399H
SPRING - A2702T
DITCH PLATE - SEE CHART
SCREW - SEE CHART ✱
"O" RING - A2916AT
WASHER - A2782AS
SPACER - A2885AP
SECTION A-A


GASKET - 1017136B
BALL - M1990G
BALL - M1990E
BALL - M1990M
SWITCH - MA866A
APPLY MA895 (THREAD SEALANT WITH TEFLON®) TO THREADS.
SECTION B-B
SPRING - 1801
SETSCREW - A2870K
NOTE: INSTALL USING MA908 (LOCTITE #242) TOP OF SCREW MUST BE FLUSH WITH - OR SLIGHTLY BELOW - BOTTOM FACE OF VALVE.





SECTION D-D
TRANSMISSION GASKET - SEE CHART ✱
DITCH PLATE GASKET - SEE CHART ✱
VALVE BODY ASSY - 1018095
△ BODY - 1018094
BALL - MA1034A
BALL - MA1034D (2)
BALL - M1990H
BALL - M1990Y (5)




X - STR. TH'D. "O" RING (ISO6149) MAIN PRESSURE OIL INLET (WHEN NOT INTERNALLY SUPPLIED). THREAD SIZE AT PORT "G" : 1/4-18 N.P.T.F. WHEN M2052AA REDUCER BUSHING IS SPECIFIED.

$A_1$ = ATMOSPHERIC PRESSURE
$A_2$ = ATMOSPHERIC PRESSURE
I.P. = INTERMEDIATE PRESSURE
C.P. = CLUTCH PRESSURE

△ NOT SERVICEABLE SEPARATELY

✱ THESE PARTS ARE TO BE PACKAGED SEPARATELY AND SHIPPED WITH UNIT.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| F | C1 D6 | 28678 | 7-24-98 | | | | | | | | |
| E | B5 | 28611 | 7-6-98 | | | | | | | | |
| D | D4 | 28585 | 6-3-98 | K | A-6 | 29751 | 12-16-99 | | | | |
| C | A1 | 28481 | 4-7-98 | J | ALL | 29197 | 3-19-99 | | | | |
| B | ALL | 28457 | 4-3-98 | H | A6 D4 | 28937 | 11-13-98 | | | | |
| A | | 27644 | 5-7-97 | G | E5 E6 | 28762 | 8-25-98 | | | | |
| REV | ZONE | CH. NO. | DATE | REV | ZONE | CH. NO. | DATE | | | | |

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MATERIAL ----------
HEAT TREAT ----------
SURFACE TREATMENT

WEIGHT kg | WR² N·m²

FIRST USE
ASSY. 1015207
MODEL MG-5202DC

NAME
VALVE ASS'Y. - CONTROL (WITHOUT TROLLING VALVE)

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X. ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 2-12-97
SCALE .50 = 1.00
DRN. RM
CHK. BE/RM
APPD. TBC

HYDRAULIC DIAGRAM A7119Y ©

METRIC

THIRD ANGLE PROJECTION

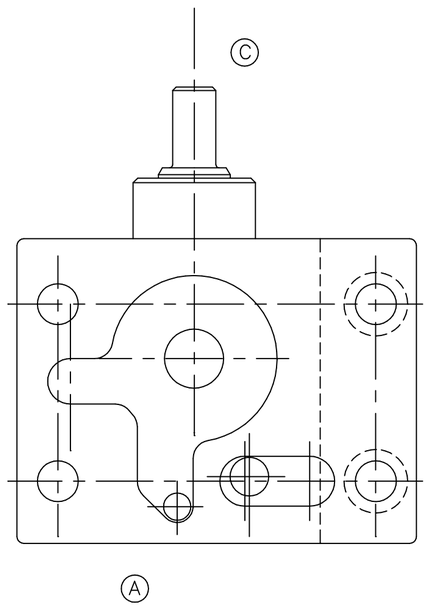
SIMILAR TO

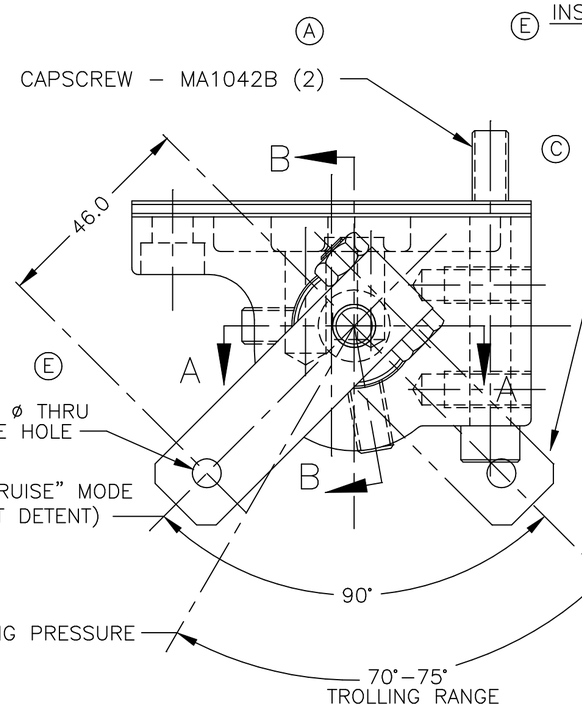
TWIN DISC INCORPORATED RACINE, WI 53403 - USA

1017172 SERIES

SHEET 1 OF 1 REV K

F E D C B A

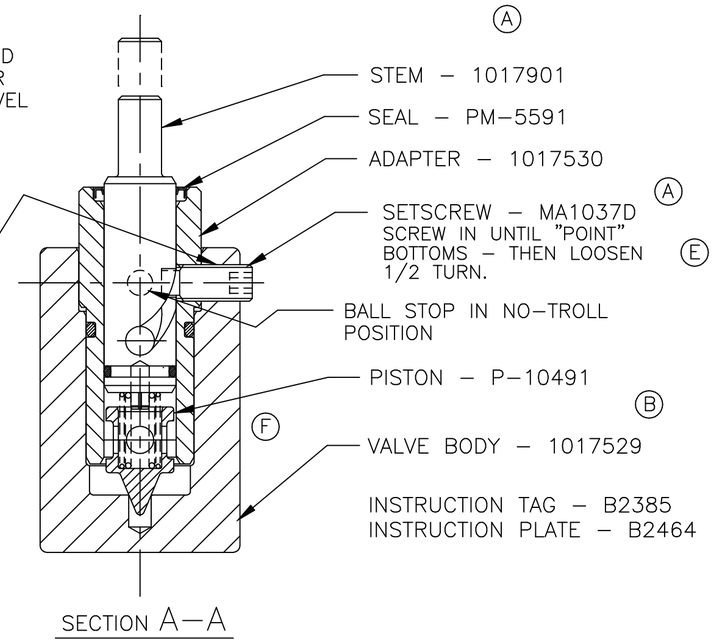


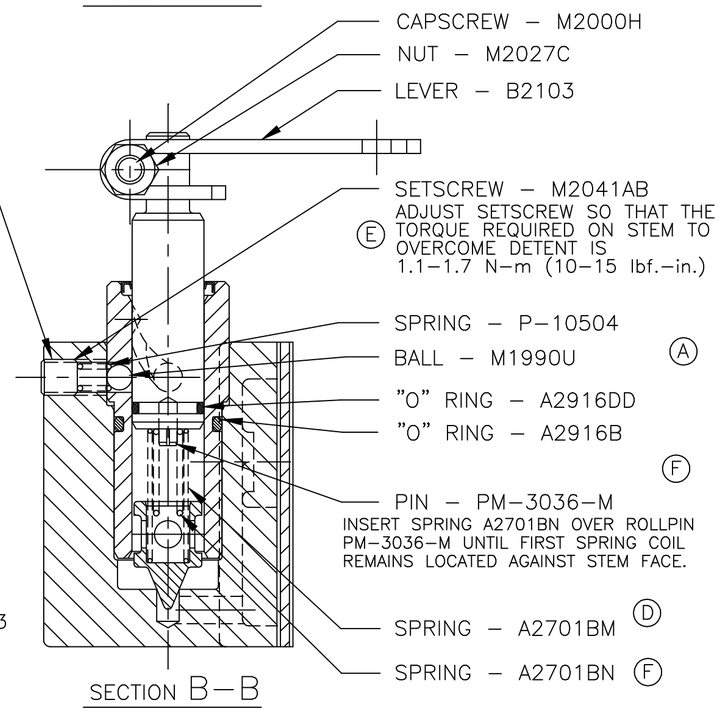

E INSTALLATION NOTE:
0.6–0.9N (5.5–8.3 lb.) AT THE 46.0 (1.81") R LOCATION OF THE 6.4 (1/4") DIA. HOLE IS REQUIRED TO OVERCOME DETENT. REMOTE CONTROL ACTUATOR MUST PROVIDE 65.0 mm (2.56") TOTAL LINEAR TRAVEL AT THE 6.4 (1/4") DIA. HOLE LOCATION.

NOTE:
THE 90° LEVER ROTATION REQUIRED FOR CONTROL MAY FALL ANYWHERE WITHIN THE 360° IN WHICH THE LEVER MAY BE CLAMPED. (PROVIDED CLEARANCE EXISTS FOR FULL 90° OF TRAVEL)

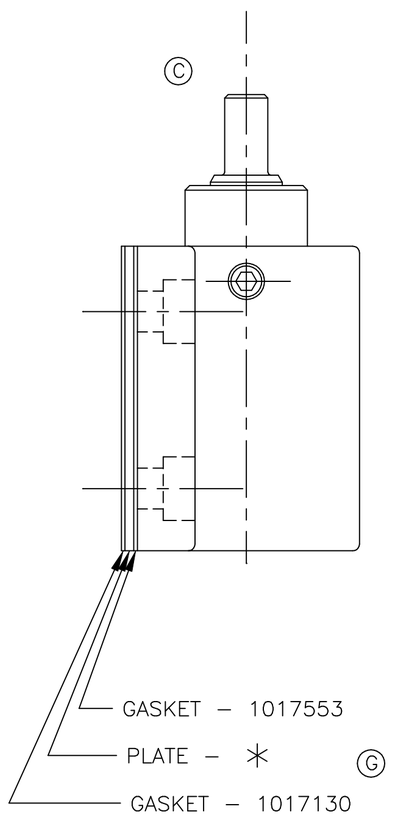
NOTE:
INSTALL USING MA908
(LOCTITE #242).

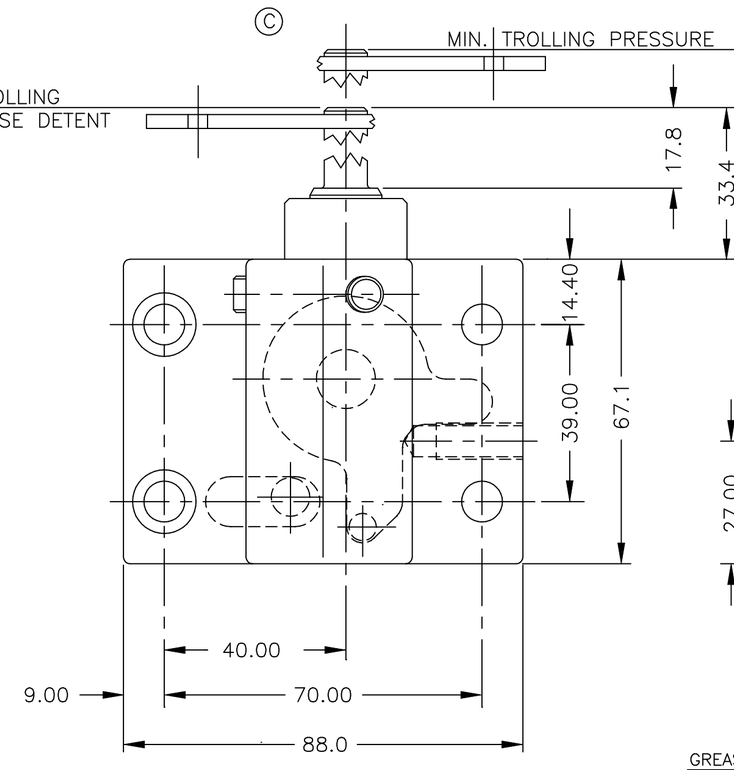


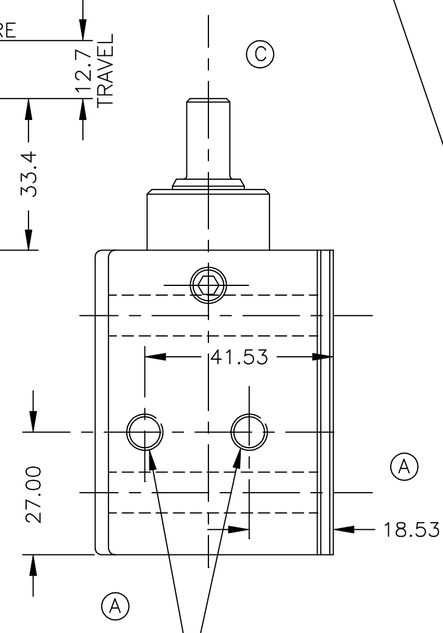

SECTION A–A




SECTION B–B




G BOM NO. 40588

G * PLATE IS NOT INCLUDED IN ASSEMBLY.
USE EXISTING PLATE FROM CONTROL VALVE.

GREASE APPLICATION PROCEEDURE:

BEFORE INSTALLING VALVE STEM INTO BODY APPLY GENERAL PURPOSE GREASE PER S–364, ITEM 6, NO. 1 NLGI CONSISTENCY TO THE VALVE STEM FROM THE "O" RING GROOVE TO NECKED–DOWN DIAMETER AT LEVER END.

METRIC

THIRD ANGLE PROJECTION

SIMILAR TO
PX–8671

| REV | ZONE | CH. NO. | DATE |
|---|---|---|---|
| G | C,D –1 A–1 | 29350 | 6–24–99 |

| REV | ZONE | CH. NO. | DATE |
|---|---|---|---|
| F | A–1,–2 A–3,–4 | 29117 | 2–4–99 |
| E | A–3,–4 B–4 C–4 | 29015 | 12–17–98 |
| D | A–2 | 28585 | 6–3–98 |
| C | ALL | 28500 | 4–20–98 |
| B | A–4 | 28315 | 1–21–98 |
| A | ALL | 28208 | 11–26–97 |

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MATERIAL

HEAT TREAT

SURFACE TREATMENT

WEIGHT kg

WR² N·m²

FIRST USE
C ASSY. 1017546
MODEL VARIOUS

NAME
VALVE ASS'Y., TROLLING

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X. ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 7–30–97
SCALE 1.0=1.0
DRN. RM
CHK. BE
APPD. BE

TWIN DISC INCORPORATED
RACINE, WI 53403 – USA

1017555

SHEET 1 OF 1 REV G

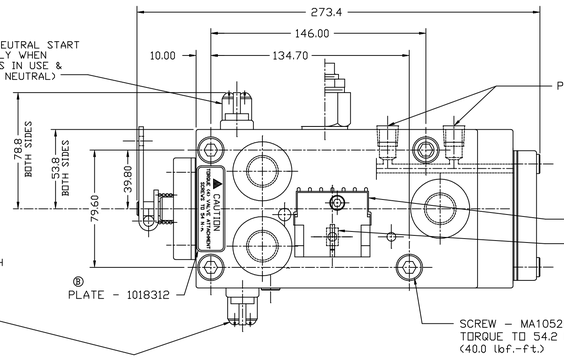
D C B A

WIRING DIAGRAM:

CONNECTOR

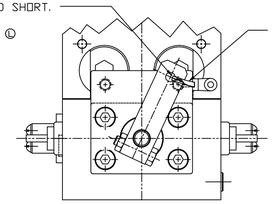
PORT 'A' SOLENOID — A
PORT 'B' SOLENOID — B
NEUTRAL SOLENOID — C
D
E
F

OPTIONAL:
MATING WIRING HARNESS 1017403
SERIES (SPECIFY LENGTH).

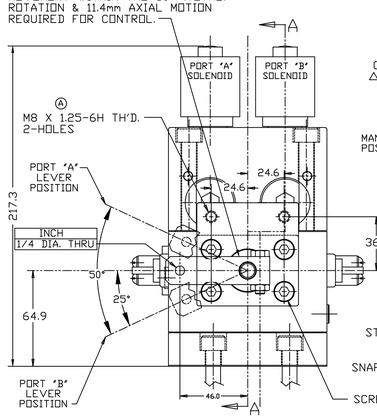

273.4
146.00
134.70
10.00
MANUAL OVERRIDE NEUTRAL START SWITCH (CLOSED ONLY WHEN MANUAL OVERRIDE IS IN USE & TRANSMISSION IS IN NEUTRAL)
PLUG - M2051K (2) Ⓔ
78.8 BOTH SIDES
53.8 BOTH SIDES
39.80
79.60
CONNECTOR, SHROUD -- 1001825
CLIP, CONNECTOR -- 1017322
ELECTRIC CONTROL MODE SWITCH (CLOSED WHEN MANUAL VALVE STEM IS LOCKED IN ELECTRIC MODE.)
Ⓑ PLATE - 1018312
SCREW - MA1052P (4) TORQUE TO 54.2 N-m. (40.0 lbf.-ft.)

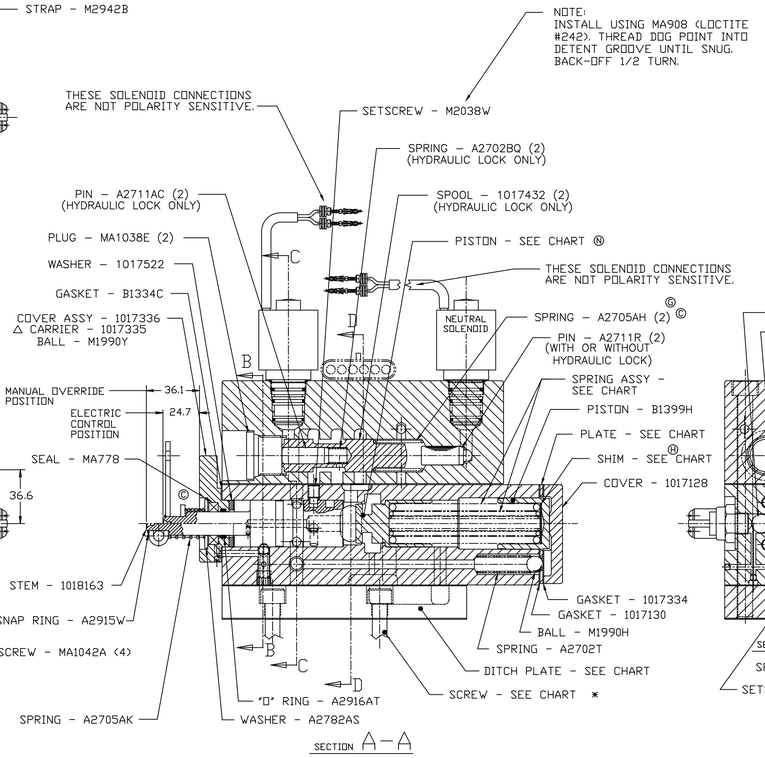
TOP VIEW

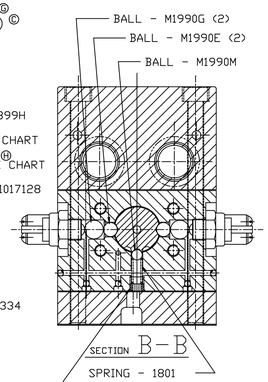
NOTE:
SECURE LEVER IN THE DEPRESSED "ELECTRIC CONTROL MODE" POSITION BY LOOPING PLASTIC STRAP THRU 1/4" HOLE IN LEVER & M8 THREADED HOLE BEHIND - PULL TIGHT, TRIM END SHORT.



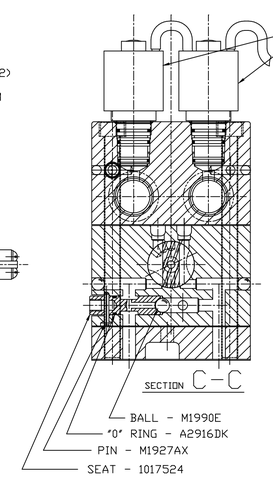

NOTE:
LEVER MAY BE LOCATED ANYWHERE ON ITS SHAFT THAT PERMITS FREE MOVEMENT WITHIN THE 50° (TOTAL) ROTATION & 11.4mm AXIAL MOTION REQUIRED FOR CONTROL.

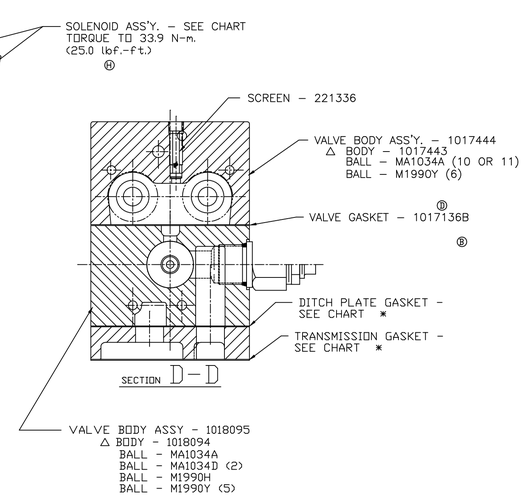


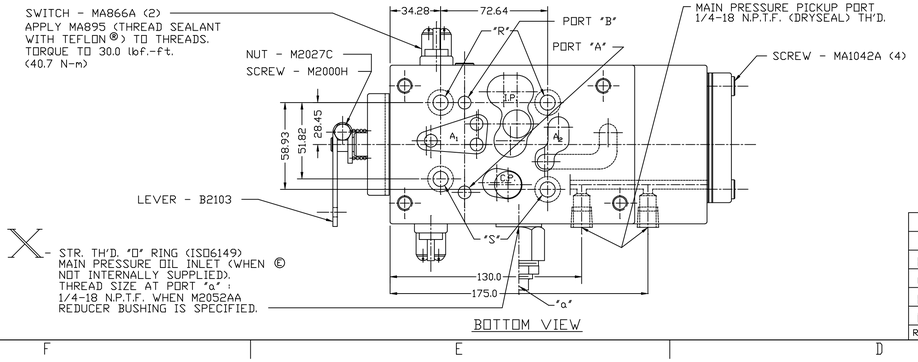


THESE SOLENOID CONNECTIONS ARE NOT POLARITY SENSITIVE.
SETSCREW - M2038W
SPRING - A2702BQ (2) (HYDRAULIC LOCK ONLY)
PIN - A2711AC (2) (HYDRAULIC LOCK ONLY)
SPOOL - 1017432 (2) (HYDRAULIC LOCK ONLY)
PLUG - MA1038E (2)
PISTON - SEE CHART Ⓝ
WASHER - 1017522
THESE SOLENOID CONNECTIONS ARE NOT POLARITY SENSITIVE. Ⓖ
GASKET - B1334C
COVER ASSY - 1017336
△ CARRIER - 1017335
BALL - M1990Y
NEUTRAL SOLENOID
SPRING - A2705AH (2) Ⓒ
PIN - A2711R (2) (WITH OR WITHOUT HYDRAULIC LOCK)
SPRING ASSY - SEE CHART
MANUAL OVERRIDE POSITION
ELECTRIC CONTROL POSITION
36.1
24.7
PISTON - B1399H
PLATE - SEE CHART
SHIM - SEE CHART Ⓗ
COVER - 1017128
SEAL - MA778
STEM - 1018163
SNAP RING - A2915W
SCREW - MA1042A (4)
GASKET - 1017334
GASKET - 1017130
BALL - M1990H
SPRING - A2702T
DITCH PLATE - SEE CHART
SCREW - SEE CHART *
"O" RING - A2916AT
SPRING - A2705AK
WASHER - A2782AS
SECTION A-A




NOTE:
INSTALL USING MA908 (LOCTITE #242). THREAD DOG POINT INTO DETENT GROOVE UNTIL SNUG. BACK-OFF 1/2 TURN.





SCREEN - 221336
VALVE BODY ASS'Y. - 1017444
△ BODY - 1017443
BALL - MA1034A (10 OR 11)
BALL - M1990Y (6)
Ⓑ
VALVE GASKET - 1017136B
DITCH PLATE GASKET - SEE CHART *
TRANSMISSION GASKET - SEE CHART *
SECTION D-D
VALVE BODY ASSY - 1018095
△ BODY - 1018094
BALL - MA1034A
BALL - MA1034D (2)
BALL - M1990H
BALL - M1990Y (5)




| VALVE ASS'Y No. | BOM No. | DITCH PLATE No. | DITCH PLATE GASKET | TRANSMISSION GASKET | PISTON | HYDRAULIC LOCK? | SOLENOID QTY. | SOLENOID No. | VOLTAGE | VALVE SPRINGS SPRING ASS'Y | VALVE SPRINGS CONSISTS OF: OUTER | VALVE SPRINGS CONSISTS OF: INNER | CLUTCH kPa (PSI) NOM. | ORIFICE PLATE No. | X | SHIMS PART NO. | SHIMS APPR. QTY. | MOUNTING SCREWS "R" * | MOUNTING SCREWS QTY. | MOUNTING SCREWS "S" * | MOUNTING SCREWS QTY. | FIRST USE | DATE AND APPR. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1018084 | 40750 | 1017133 | 1017134 | B1337F | 1018688 | YES | 3 | XM2759FM | 24 VDC | XA2707Z | A2707Z | A2703T | 1725 (250) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | | MA1052A | 2 | MA1052A | 2 | MG-5202DC | 3-17-98 DAS/BJE |
| 1018084A | 40751 | ------ | 1017383 | ------ | 1017179 | NO | 2 | XM2759FM | 24 VDC | ------ | A2707BD | A2704BU | 2415 (350) | 1017129A | MA1038E(M27 X 2.0-6H) | B2451B | | ------ | | ------ | | MG-6619-00-RV | 3-17-98 DAS/BJE |
| 1018084B | 40752 | 1017133 | 1017134 | B1337F | 1017179 | NO | 2 | XM2759FM | 24 VDC | ------ | A2707AD | | 1585 (230) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | | M2089F | 2 | M2089AG | 2 | DD-514V | 3-17-98 DAS/BJE |
| 1018084C | 40753 | 1017133 | 1017134 | B1337F | 1017179 | NO | 2 | XM2759FM | 24 VDC | XA2707BZ | A2707BW | A2703BA | 1380 (200) | 1017129 | M2051L MA1038E(M27 X 2.0-6H) M2052AA MA1053G | B2451B | | M2089Y | 1 | M2089F | 3 | DD-516V | 3-17-98 DAS/BJE |
| 1018084D | 40754 | 1017133 | 1017134 | B1337F | 1017179 | NO | 2 | XM2759FL | 12 VDC | ------ | A2707AD | | 1585 (230) | 1017129 | M2051L MA1038E(M27 X 2.0-6H) M2052AA MA1053G | B2451B | | M2089F | 2 | M2089AG | 2 | DD-514V | 3-17-98 DAS/BJE |
| 1018084E | 40755 | 1017133 | 1017134 | B1337F | 1017179 | NO | 2 | XM2759FL | 12 VDC | XA2707BZ | A2707BW | A2703BA | 1380 (200) | 1017129 | M2051L MA1038E(M27 X 2.0-6H) M2052AA MA1053G | B2451B | | M2089Y | 1 | M2089F | 3 | DD-516V | 3-17-98 DAS/BJE |
| 1018084F | 40756 | 1017133A | 1017134 | B1337F | 1018688 | NO | 2 | XM2759FM | 24 VDC | XA2707Z | A2707Z | A2703T | 1725 (250) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | USE AS REQUIRED | M2089F | 2 | M2089F | 2 | MG-5111 | 3-17-98 DAS/BJE |
| 1018084G | 40757 | 1017133A | 1017134 | B1337F | 1018688 | NO | 2 | XM2759FL | 12 VDC | XA2707Z | A2707Z | A2703T | 1725 (250) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | | M2089F | 2 | M2089F | 2 | MG-5111 | 3-17-98 DAS/BJE |
| Ⓟ Ⓕ 1018084H | 40758 | 1017583 | 1017569 | 1017613 | 1018688 | NO | 2 | XM2759FM | 24 VDC | XA2707Z | A2707Z | A2703T | 2000 (290) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | | MA1062B | 2 | MA1062G | 2 | MG-5600 | 3-17-98 DAS/BJE |
| Ⓟ Ⓕ 1018084J | 40761 | 1017583 | 1017569 | 1017613 | 1018688 | NO | 2 | XM2759FL | 12 VDC | XA2707Z | A2707Z | A2703T | 2000 (290) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | | MA1062B | 2 | MA1062G | 2 | MG-5600 | 3-17-98 DAS/BJE |
| 1018084K | 40762 | 1017133A | 1017134 | B1337F | 1017179 | NO | 2 | XM2759FM | 24 VDC | -------- | A2707AD | | 1585 (230) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | | MA1052B | 2 | MA1052B | 2 | MG-5114 | 3-17-98 DAS/BJE |
| 1018084L | 40763 | 1017133A | 1017134 | B1337F | 1017179 | NO | 2 | XM2759FL | 12 VDC | -------- | A2707AD | | 1585 (230) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | | MA1052B | 2 | MA1052B | 2 | MG-5114 | 3-17-98 DAS/BJE |
| Ⓕ 1018084M | 40764 | -------- | 1017383 | -------- | 1018688 | NO | 2 | XM2759FM | 24 VDC | -------- | A2702BC A2707AX | A2704BU | 2415 (350) | 1017129A | MA1038E(M27 X 2.0-6H) | B2451B | | ------ | | ------ | | MG-6984 61242 | 3-17-98 DAS/BJE |
| Ⓟ Ⓕ 1018084N | 40775 | 1017583 | 1017569 | 1017613 | 1018688 | NO | 2 | XM2759FM | 24 VDC | XA2707Z | A2707Z | A2703T | 2000 (290) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | | MA1062B | 2 | MA1062J | 2 | MG-5600DR | 4-8-98 DAS |
| Ⓠ Ⓝ Ⓕ 1018084P | 40817 | -------- | 1017569 | -------- | 1018688 | NO | 2 | XM2759FM | 24 VDC | XA2707AD | A2707AD | A2703AB | 2000 (290) | 1017129B | MA1038E(M27 X 2.0-6H) | B2451B | | ------ | | ------ | | MG-6650-00-SC | 7-23-98 DAS/AZ |
| Ⓚ 1018084Q | 40842 | 1017133 | 1017134 | B1337F | 1018688 | NO | 2 | XM2759FM | 24 VDC | XA2707Z | A2707Z | A2703T | 1725 (250) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | | MA1052K | 2 | MA1052K | 2 | MG-5202SC | 8-5-98 DAS/RM |
| 1018084R | 40935 | ------- | 1017383 | ------- | 1017179 | YES | 3 | XM2759FM | 24 VDC | ------- | A2707BD | A2704BU | 2415 (350) | 1017129A | MA1038E(M27 X 2.0-6H) | B2451B | | ------ | | ------ | | MG-6557-00 | 10-9-98 JHB/DAS |
| 1018084S | 40954 | 1018584 | 1018594 | B3117A | 1018688 | NO | 2 | XM2759FM | 24 VDC | XA2707Z | A2707Z | A2703T | 1725 (250) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | | M1732AH | 2 | M1732AH | 2 | MG-540 | 11-6-98 DAS/BJE |
| 1018084T | 40955 | -------- | 1017383 | -------- | 1017179 | NO | 2 | XM2759FM | 24 VDC | -------- | A2702BC A2707BD | A2704BU | 2655 (385) | 1017129A | MA1038E(M27 X 2.0-6H) | B2451B | | ------ | | ------ | | MG-6449 | 11-6-98 DAS/BJE |
| 1018084U | 40956 | -------- | 1017383 | -------- | 1017179 | NO | 2 | XM2759FM | 24 VDC | -------- | A2702BC A2707AX | A2704BU | 2550 (370) | 1017129A | MA1038E(M27 X 2.0-6H) | B2451B | 3 | ------ | | ------ | | MG-6557 | 11-6-98 DAS/BJE |
| 1018084V | 40957 | -------- | 1017383 | -------- | 1017179 | NO | 2 | XM2759FM | 24 VDC | -------- | A2702BC A2707AX | A2704BU | 2450 (355) | 1017129A | MA1038E(M27 X 2.0-6H) | B2451B | AS REQ. | ------ | | ------ | | MG-6600 MG-6619 | 11-6-98 DAS/BJE |
| Ⓙ 1018084W | 40958 | 1017133 | 1017134 | B1337F | 1018688 | NO | 2 | XM2759FM | 24 VDC | XA2707Z | A2707Z | A2703T | 1725 (250) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | AS REQ. | MA1052A | 2 | MA1052A | 2 | MG-5202DC | 11-18-98 VR/VTV |
| 1018084X | 40964 | 1017133A | 1017134 | B1337F | 1018688 | NO | 2 | XM2759FM | 24 VDC | XA2707Z | A2707Z | A2703T | 1725 (250) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | AS REQ. | M2089AR | 2 | M2089AR | 2 | MG-5141 | 11-24-98 RM/VTV |
| Ⓜ Ⓠ 1018084Y | 41028 | -------- | 1017569 | -------- | 1018688 | NO | 2 | XM2759FL | 12 VDC | XA2707AD | A2707AD | A2703AB | 2000 (290) | 1017129B | MA1038E(M27 X 2.0-6H) | B2451B | AS REQ. | ------ | | ------ | | MG-6650-00-SC | 12-22-98 TJM/DAS |
| Ⓡ 1018084Z | 41045 | -------- | 1017134 | -------- | 1018688 | NO | 2 | XM2759FM | 24 VDC | XA2707AD | A2707AD | A2703AB | 2000 (290) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | AS REQ. | ------ | | ------ | | MG-5205DC | 2-18-99 JS/BJE |
| 1018084AA | | 1017583 | 1017569 | 1017613 | 1018688 | NO | 2 | XM2759FL | 12 VDC | XA2707Z | A2707Z | A2703T | 2000 (290) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | | MA1062B | 2 | MA1062J | 2 | MG-5600DR | 4-8-98 DAS |
| 1018084AB | 41093 | 1017133 | 1017134 | B1337F | 1018688 | NO | 2 | XM2759FL | 12 VDC | XA2707Z | A2707Z | A2703T | 1725 (250) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | AS REQ. | MA1052A | 2 | MA1052A | 2 | MG-5202DC | 5-26-99 JS/WTV |
| 1018084AC | 40967 | -------- | 1017383 | -------- | 1017179 | YES | 3 | XM2759FM | 24 VDC | -------- | A2702BC A2707BD | A2704BU | 2655 (385) | 1017129A | MA1038E(M27 X 2.0-6H) | B2451B | AS REQ. | ------ | | ------ | | MG-6449-RV | 7-9-99 JS/DAS |
| Ⓢ Ⓖ 1018084AD | 41114 | -------- | -------- | -------- | 1018688 | NO | 2 | XM2759FL | 12 VDC | -------- | A2702BC A2707BD | A2704BU | 2415 (350) | 1017129B | MA1038E(M27 X 2.0-6H) | B2451B | AS REQ. | ------ | | ------ | | MG-6848-00-SC | 8-2-99 ALC/DAS |
| Ⓢ Ⓠ 1018084AE | 41115 | -------- | -------- | -------- | 1018688 | NO | 2 | XM2759FL | 12 VDC | -------- | A2702BC A2707BD | A2704BU | 2415 (350) | 1017129B | MA1038E(M27 X 2.0-6H) | B2451B | AS REQ. | ------ | | ------ | | MG-6848-00-SC | 8-2-99 ALC/DAS |
| 1018084AF | 41118 | 1017133 | 1017134 | B1337F | 1018688 | NO | 2 | XM2759FL | 12 VDC | XA2707Z | A2707Z | A2703T | 1725 (250) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | AS REQ. | MA1052K | 2 | MA1052K | 2 | MG-5202SC | 8-11-99 JS/DAS |
| 1018084AG | 41163 | ------- | 1017134 | ------- | 1018688 | NO | 2 | XM2759FL | 12 VDC | XA2707AD | A2707AD | A2703AB | 2000 (290) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | AS REQ. | ------ | | ------ | | MG-5205DC | 11/19/99 ALC/DAS |
| 1018084AH | 41171 | ------- | ------- | ------- | 1017179 | NO | 2 | XM2759FM | 24 VDC | XA2707Z | A2707Z | A2703T | 1725 (250) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | AS REQ. | ------ | | ------ | | MG-5170DC | 11/19/99 ALC/DAS |
| 1018084AJ | 41172 | ------- | ------- | ------- | 1017179 | NO | 2 | XM2759FL | 12 VDC | XA2707Z | A2707Z | A2703T | 1725 (250) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | AS REQ. | ------ | | ------ | | MG-5170DC | 11/19/99 ALC/DAS |
| 1018084AK | | | | | | | | | | | | | | | | | | | | | | | |

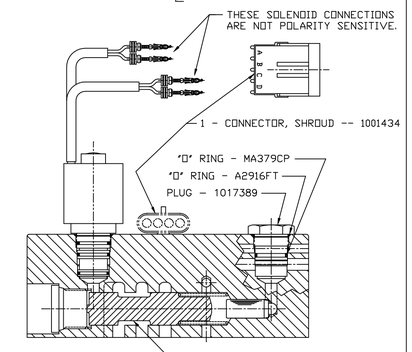
Ⓗ Ⓗ

PARTS FOR UNITS WITHOUT NEUTRAL SOLENOID AND HYDRAULIC LOCK (OPTIONAL CONDITION)

WIRING DIAGRAM:

CONNECTOR
PORT 'A' SOLENOID — A
PORT 'B' SOLENOID — B
C
D

OPTIONAL:
MATING WIRING HARNESS 1017404
SERIES (SPECIFY LENGTH).


THESE SOLENOID CONNECTIONS ARE NOT POLARITY SENSITIVE.
1 - CONNECTOR, SHROUD -- 1001434
"O" RING - MA379CP
"O" RING - A2916FT
PLUG - 1017389
SPOOL - 1017433 (2)

$A_1$ = ATMOSPHERIC PRESSURE
$A_2$ = ATMOSPHERIC PRESSURE
I.P. = INTERMEDIATE PRESSURE
C.P. = CLUTCH PRESSURE

△ NOT SERVICEABLE SEPARATELY

* THESE PARTS ARE TO BE PACKAGED SEPARATELY AND SHIPPED WITH UNIT.

| REV | ZONE | CH. NO. | DATE | REV | ZONE | CH. NO. | DATE |
|---|---|---|---|---|---|---|---|
| S | D-4 | 29757 | 12-1-99 | | | | |
| R | A-5 C-5 | 29694 | 11-22-99 | | | | |
| Q | B-5 | 29515 | 8-20-99 | | | | |
| P | B-5 B-6 | 29272 | 5-13-99 | | | | |
| N | E-4 | 29232 | 4-15-99 | | | | |

NOTICE! THIS PRINT CONTAINS PROPRIETARY INFORMATION AND IS NOT TO BE USED IN ANY MANNER DETRIMENTAL TO THE INTERESTS OF TWIN DISC, INCORPORATED RACINE, WI 53403 - USA THIS NOTICE IS NOT INTENDED TO NULLIFY OR LIMIT RIGHTS GRANTED TO THE U.S. GOVERNMENT OR OTHERS BY CONTRACT.

MATERIAL: ----------
HEAT TREAT: ----------
SURFACE TREATMENT:
WEIGHT: kg / N m²
FIRST USE: ASSY. 1015207 MODEL MG-5202DC
NAME: VALVE ASS'Y. - CONTROL (WITHOUT TROLLING VALVE)

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS X. ±0.75 X.X ±0.25 X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 3-23-98
SCALE .50 = 1.00
DRN. RM
CHK. RM/BJE
APP'D. DAS

TWIN DISC INCORPORATED RACINE, WI 53403 - USA

1018084 SERIES

SHEET 1 OF 1 REV S

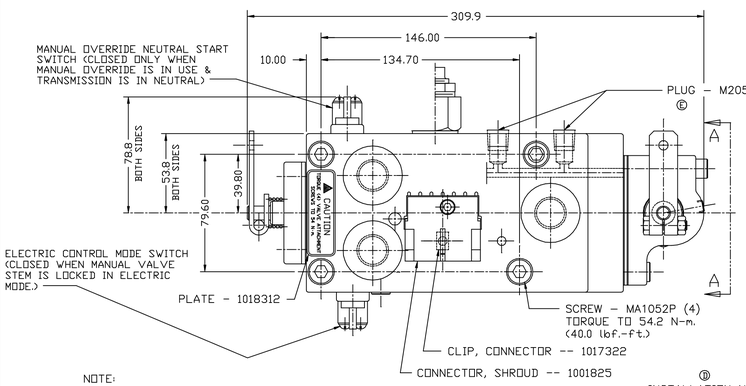
HYDRAULIC DIAGRAM A7119W, SHEET 1 OF 2

METRIC

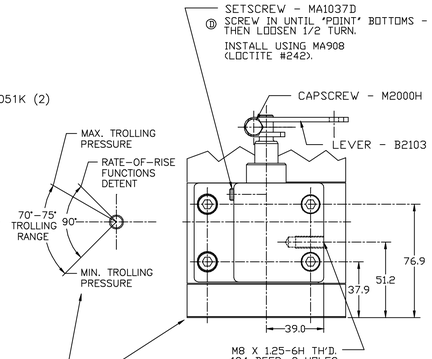
THIRD ANGLE PROJECTION

SIMILAR TO

F E D C B A
6 5 4 3 2 1


309.9
146.00
134.70
10.00
MANUAL OVERRIDE NEUTRAL START SWITCH (CLOSED ONLY WHEN MANUAL OVERRIDE IS IN USE & TRANSMISSION IS IN NEUTRAL)
PLUG - M2051K (2)
78.8 BOTH SIDES
53.8 BOTH SIDES
39.80
79.60
CAUTION
ELECTRIC CONTROL MODE SWITCH (CLOSED WHEN MANUAL VALVE STEM IS LOCKED IN ELECTRIC MODE.)
PLATE - 1018312
SCREW - MA1052P (4) TORQUE TO 54.2 N-m. (40.0 lbf.-ft.)
CLIP, CONNECTOR -- 1017322
CONNECTOR, SHROUD -- 1001825
A
A

TOP VIEW




VIEW A-A

Ⓑ INSTALLATION NOTE:
0.6-0.9 N (5.5-8.3 lb.) AT THE 46.0 (1.81") R LOCATION OF THE 6.4mm (1/4") DIA. HOLE IS REQUIRED TO OVERCOME DETENT. REMOTE CONTROL ACTUATOR MUST PROVIDE 65.0mm (2.56") TOTAL LINEAR TRAVEL AT THE 6.4mm (1/4") DIA. HOLE.

| VALVE ASS'Y No. | BOM No. | DITCH PLATE No. | DITCH PLATE GASKET | TRANSMISSION GASKET | PISTON | HYDRAULIC LOCK? | SOLENOID QTY. | SOLENOID No. | VOLTAGE | VALVE SPRINGS ASS'Y | VALVE SPRINGS CONSISTS OF : OUTER | VALVE SPRINGS CONSISTS OF : INNER | CLUTCH kPa (PSI) NOM. | ORIFICE PLATE No. | X | SHIMS PART NO. | SHIMS APPX. QTY. | MOUNTING SCREWS "R" | MOUNTING SCREWS QTY. | MOUNTING SCREWS "S" | MOUNTING SCREWS QTY. | FIRST USE | DATE AND APPR. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1018440 | | 1017133 | 1017134 | B1337F | 1018688 | YES | 3 | XM2759FM | 24 VDC | XA2707Z | A2707Z | A2703T | 1725 (250) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | USE AS REQUIRED | MA1052A | 2 | MA1052A | 2 | MG-5202DC | PRELIMINARY |
| 1018440A | | ------ | 1017383 | ------ | 1017179 | NO | 2 | XM2759FM | 24 VDC | ------ | A2707BD | A2704BU | 2415 (350) | 1017129A | MA1038E(M27 X 2.0-6H) | B2451B | | ------ | | ------ | | MG-6619-00-RV | PRELIMINARY |
| 1018440B | | 1017133 | 1017134 | B1337F | 1017179 | NO | 2 | XM2759FM | 24 VDC | ------ | A2707AD | | 1585 (230) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | | M2089F | 2 | M2089AG | 2 | DD-514V | PRELIMINARY |
| 1018440C | | 1017133 | 1017134 | B1337F | 1017179 | NO | 2 | XM2759FM | 24 VDC | XA2707BZ | A2707BW | A2703BA | 1380 (200) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | | M2089Y | 1 | M2089F | 3 | DD-516V | PRELIMINARY |
| 1018440D | | 1017133 | 1017134 | B1337F | 1017179 | NO | 2 | XM2759FL | 12 VDC | ------ | A2707AD | | 1585 (230) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | | M2089F | 2 | M2089AG | 2 | DD-514V | PRELIMINARY |
| 1018440E | | 1017133 | 1017134 | B1337F | 1017179 | NO | 2 | XM2759FL | 12 VDC | XA2707BZ | A2707BW | A2703BA | 1380 (200) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | | M2089Y | 1 | M2089F | 3 | DD-516V | PRELIMINARY |
| 1018440F | | 1017133A | 1017134 | B1337F | 1018688 | NO | 2 | XM2759FM | 24 VDC | XA2707Z | A2707Z | A2703T | 1725 (250) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | | M2089F | 2 | M2089F | 2 | MG-5111 | PRELIMINARY |
| 1018440G | | 1017133A | 1017134 | B1337F | 1018688 | NO | 2 | XM2759FL | 12 VDC | XA2707Z | A2707Z | A2703T | 1725 (250) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | | M2089F | 2 | M2089F | 2 | MG-5111 | PRELIMINARY |
| Ⓗ Ⓐ 1018440H | 41175 | 1017583 | 1017569 | 1017613 | 1018688 | NO | 2 | XM2759FM | 24 VDC | XA2707Z | A2707Z | A2703T | 2000 (290) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | 0 | MA1062B | 2 | MA1062G | 2 | MG-5600 | ALC/DAS |
| Ⓐ 1018440J | 41176 | 1017583 | 1017569 | 1017613 | 1018688 | NO | 2 | XM2759FL | 12 VDC | XA2707Z | A2707Z | A2703T | 2000 (290) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | 0 | MA1062B | 2 | MA1062G | 2 | MG-5600 | ALC/DAS |
| 1018440K | | 1017133A | 1017134 | B1337F | 1017179 | NO | 2 | XM2759FM | 24 VDC | -------- | A2707AD | | 1585 (230) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | USE AS REQUIRED | MA1052B | 2 | MA1052B | 2 | MG-5114 | PRELIMINARY |
| 1018440L | | 1017133A | 1017134 | B1337F | 1017179 | NO | 2 | XM2759FL | 12 VDC | -------- | A2707AD | | 1585 (230) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | | MA1052B | 2 | MA1052B | 2 | MG-5114 | PRELIMINARY |
| Ⓐ 1018440M | | -------- | 1017383 | ------- | 1018688 | NO | 2 | XM2759FM | 24 VDC | -------- | A2702BC A2707AX | A2704BU | 2415 (350) | 1017129A | MA1038E(M27 X 2.0-6H) | B2451B | | ------ | | ------ | | MG-6984 61242 | PRELIMINARY |
| Ⓗ Ⓐ 1018440N | | 1017583 | 1017569 | 1017613 | 1018688 | NO | 2 | XM2759FM | 24 VDC | XA2707Z | A2707Z | A2703T | 2000 (290) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | 0 | | | | 2 | MG-5600DR | PRELIMINARY |
| Ⓚ 1018440P | 41169 | 1018584 | 1018594 | B3117A | 1018688 | NO | 2 | XM2759FM | 24 VDC | XA2707Z | A2707Z | A2703T | 1725 (250) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | AS REQ. | M1732AH | 2 | M1732AH | 2 | MG-540 | 11-6-98 DAS/BJE |
| 1018440Q | | -------- | 1017383 | -------- | 1017179 | NO | 2 | XM2759FM | 24 VDC | -------- | A2707BD A2702BC | A2704BU | 2655 (385) | 1017129A | MA1038E(M27 X 2.0-6H) | B2451B | | ------ | | ------ | | MG-6449 | 11-6-98 DAS/BJE |
| 1018440R | | -------- | 1017383 | -------- | 1017179 | NO | 2 | XM2759FM | 24 VDC | -------- | A2707AX A2702BC | A2704BU | 2550 (370) | 1017129A | MA1038E(M27 X 2.0-6H) | B2451B | 3 | ------ | | ------ | | MG-6557 | 11-6-98 DAS/BJE |
| 1018440S | | -------- | 1017383 | -------- | 1017179 | NO | 2 | XM2759FM | 24 VDC | -------- | A2707AX A2702BC | A2704BU | 2450 (355) | 1017129A | MA1038E(M27 X 2.0-6H) | B2451B | AS REQ. | ------ | | ------ | | MG-6600 MG-6619 | 11-6-98 DAS/BJE |
| Ⓙ Ⓚ 1018440T | 41164 | -------- | 1017134 | -------- | 1018688 | NO | 2 | XM2759FM | 24 VDC | XA2707AD | A2707AD | A2703AB | 2000 (290) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | AS REQ. | ------ | | ------ | | MG-5205DC | 6-24-99 ALC/DAS |
| 1018440U | 41132 | 1017133 | 1017134 | B1337F | 1018688 | NO | 2 | XM2759FM | 24 VDC | XA2707Z | A2707Z | A2703T | 1725 (250) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | AS REQ. | ------ | | ------ | | MG-5204SC | 9-16-99 ALC/DAS |
| 1018440V | 41153 | -------- | -------- | -------- | 1018688 | NO | 2 | XM2759FM | 24 VDC | -------- | A2707BD A2702BC | A2704BU | 2415 (350) | 1017129B | MA1038E(M27 X 2.0-6H) | B2451B | AS REQ. | ------ | | ------ | | MG-6848-00-SC | 11/19/99 ALC/DAS |
| 1018440W | 41178 | -------- | -------- | -------- | 1017179 | NO | 2 | XM2759FM | 24 VDC | XA2707Z | A2707Z | A2703T | 1725 (250) | 1017129 | MA1038E(M27 X 2.0-6H) | B2451B | AS REQ. | ------ | | ------ | | MG-516 | 11/19/99 ALC/DAS |
| 1018440X | 41177 | -------- | 1017569 | -------- | 1018688 | NO | 2 | XM2759FM | 24 VDC | XA2707AD | A2707AD | A2703AB | 2000 (290) | 1017129B | MA1038E(M27 X 2.0-6H) | B2451B | AS REQ. | ------ | | ------ | | MG-6650SC | 1/18/00 ALC/DAS |
| 1018440Y | | | | | | | | | | | | | | | | | | | | | | | |
| 1018440Z | | | | | | | | | | | | | | | | | | | | | | | |
| 1018440AA | | | | | | | | | | | | | | | | | | | | | | | |
| 1018440AB | | | | | | | | | | | | | | | | | | | | | | | |
| 1018440AC | | | | | | | | | | | | | | | | | | | | | | | |
| 1018440AD | | | | | | | | | | | | | | | | | | | | | | | |
| 1018440AE | | | | | | | | | | | | | | | | | | | | | | | |
| 1018440AF | | | | | | | | | | | | | | | | | | | | | | | |
| 1018440AG | | | | | | | | | | | | | | | | | | | | | | | |
| 1018440AH | | | | | | | | | | | | | | | | | | | | | | | |
| 1018440AJ | | | | | | | | | | | | | | | | | | | | | | | |
| 1018440AK | | | | | | | | | | | | | | | | | | | | | | | |

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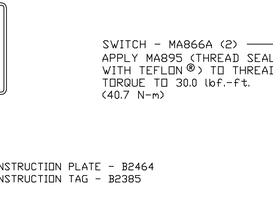
NOTE:
SECURE LEVER IN THE DEPRESSED "ELECTRIC CONTROL MODE" POSITION BY LOOPING PLASTIC STRAP THRU 1/4" HOLE IN LEVER & M8 THREADED HOLE BEHIND - PULL TIGHT, TRIM END SHORT.




NOTE:
INSTALL USING MA908 (LOCTITE #242). THREAD DOG POINT INTO DETENT GROOVE UNTIL SNUG. BACK-OFF 1/2 TURN.

THESE SOLENOID CONNECTIONS ARE NOT POLARITY SENSITIVE.

SETSCREW - M2038W

SPRING - A2702BQ (2) (HYDRAULIC LOCK ONLY)

PIN - A2711AC (2) (HYDRAULIC LOCK ONLY)

SPOOL - 1017432 (2) (HYDRAULIC LOCK ONLY)

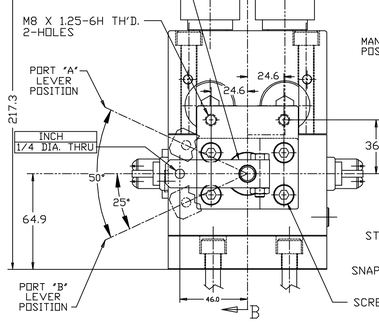
PISTON - SEE CHART ©

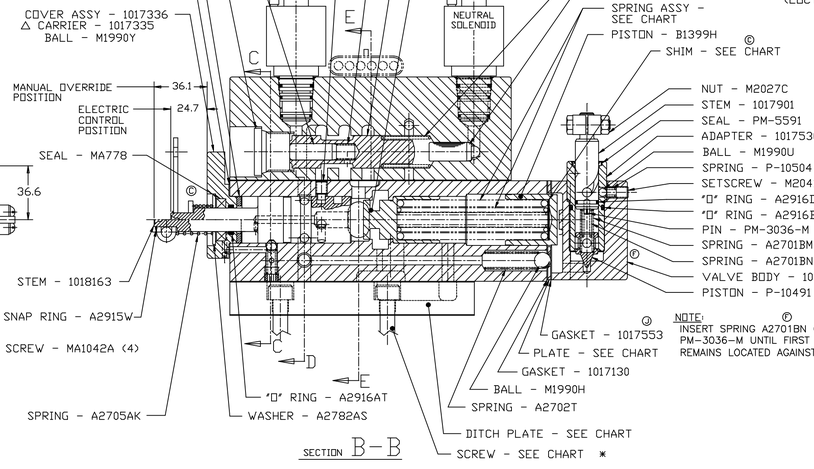
WIRING DIAGRAM:




OPTIONAL:
MATING WIRING HARNESS 1017403 SERIES (SPECIFY LENGTH).

NOTE:
LEVER MAY BE LOCATED ANYWHERE ON ITS SHAFT THAT PERMITS FREE MOVEMENT WITHIN THE 50° (TOTAL) ROTATION & 11.4mm AXIAL MOTION REQUIRED FOR CONTROL.

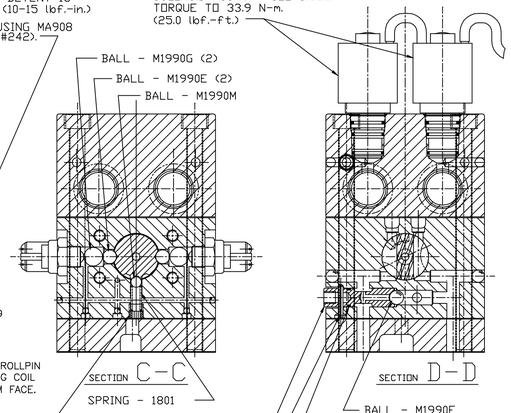


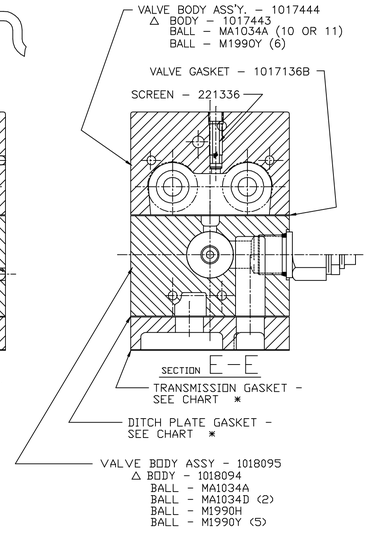




SECTION B-B

NOTE:
ADJUST SETSCREW SO THAT Ⓓ THE TORQUE REQUIRED TO OVERCOME DETENT IS 1.1-1.7 Nm (10-15 lbf.-in.)
INSTALL USING MA908 (LOCTITE #242).

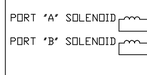
Ⓕ NOTE:
INSERT SPRING A2701BN OVER ROLLPIN PM-3036-M UNTIL FIRST SPRING COIL REMAINS LOCATED AGAINST STEM FACE.


SOLENOID ASS'Y. - SEE CHART TORQUE TO 33.9 N-m. (25.0 lbf.-ft.)
BALL - M1990G (2)
BALL - M1990E (2)
BALL - M1990M
SECTION C-C
SPRING - 1801
SETSCREW - A2870K
NOTE:
INSTALL USING MA908 (LOCTITE #242) TOP OF SCREW MUST BE FLUSH WITH SURFACE.
SECTION D-D
BALL - M1990E
"O" RING - A2916DK
PIN - M1927AX
SEAT - 1017524

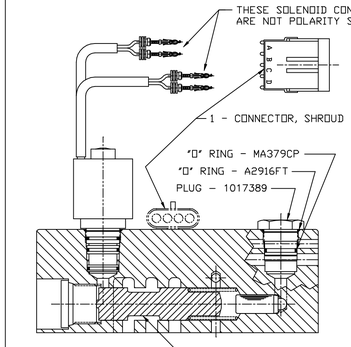

VALVE BODY ASS'Y. - 1017444
△ BODY - 1017443
BALL - MA1034A (10 OR 11)
BALL - M1990Y (6)
VALVE GASKET - 1017136B
SCREEN - 221336
SECTION E-E
TRANSMISSION GASKET - SEE CHART *
DITCH PLATE GASKET - SEE CHART *
VALVE BODY ASSY - 1018095
△ BODY - 1018094
BALL - MA1034A
BALL - MA1034D (2)
BALL - M1990H
BALL - M1990Y (5)

PARTS FOR UNITS WITHOUT NEUTRAL SOLENOID AND HYDRAULIC LOCK (OPTIONAL CONDITION)

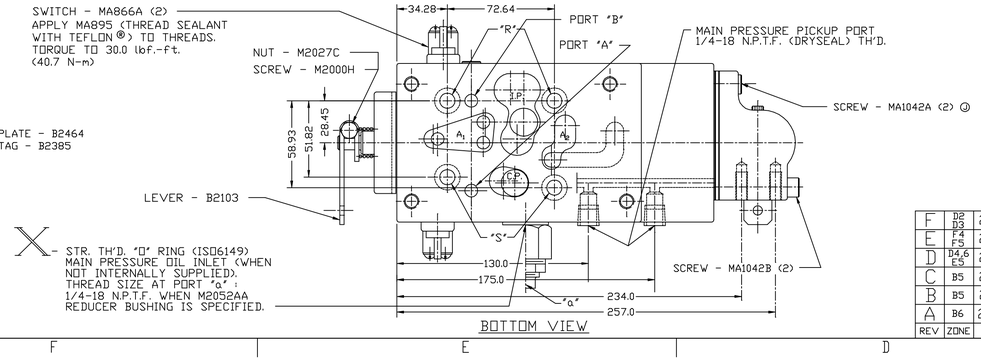
WIRING DIAGRAM:




OPTIONAL:
MATING WIRING HARNESS 1017404 SERIES (SPECIFY LENGTH).


THESE SOLENOID CONNECTIONS ARE NOT POLARITY SENSITIVE.
1 - CONNECTOR, SHROUD -- 1001434
"O" RING - MA379CP
"O" RING - A2916FT
PLUG - 1017389
SPOOL - 1017433 (2)

INSTRUCTION PLATE - B2464
INSTRUCTION TAG - B2385




BOTTOM VIEW

X - STR. TH'D. "O" RING (ISO6149) MAIN PRESSURE OIL INLET (WHEN NOT INTERNALLY SUPPLIED). THREAD SIZE AT PORT "a" : 1/4-18 N.P.T.F. WHEN M2052AA REDUCER BUSHING IS SPECIFIED.

$A_1$ = ATMOSPHERIC PRESSURE
$A_2$ = ATMOSPHERIC PRESSURE
I.P. = INTERMEDIATE PRESSURE
C.P. = CLUTCH PRESSURE

△ NOT SERVICEABLE SEPARATELY

* THESE PARTS ARE TO BE PACKAGED SEPARATELY AND SHIPPED WITH UNIT.

| REV | ZONE | CH. NO. | DATE |
|---|---|---|---|
| F | D2 D3 | 29117 | 2-4-99 |
| E | F4 F5 | 29067 | 1-25-99 |
| D | D4,6 E5 | 29015 | 12-17-98 |
| C | B5 | 28937 | 11-13-98 |
| B | B5 | 28921 | 11-2-98 |
| A | B6 | 28844 | 10-28-98 |
| K | A5 C5 | 29694 | 11-22-99 |
| J | D1,2 D5 | 29350 | 6-24-99 |
| H | B5 B6 | 29272 | 5-13-99 |
| G | E3 | 29232 | 4-15-99 |

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MATERIAL: ----------
HEAT TREAT: ----------
SURFACE TREATMENT:
WEIGHT: kg / N·m²
FIRST USE: ASSY. 1015207 MODEL MG-5202DC
NAME: VALVE ASS'Y. - CONTROL (WITH TROLLING VALVE)

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS: X ±0.75, X.X ±0.25, X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 10-12-98
SCALE .50 = 1.00
DRN. RM
CHK. BE
APP'D. DAS

TWIN DISC INCORPORATED RACINE, WI 53403 - USA

1018440 SERIES

SHEET 1 OF 1 REV K

HYDRAULIC DIAGRAM A7119W, SHEET 3 OF 3

METRIC

THIRD ANGLE PROJECTION

SIMILAR TO

F E D C B A

## AUXILIARY PUMP DRIVE AND AUXILIARY PUMP INSTALLATION INSTRUCTIONS:

1.) REMOVE MA1038A PLUG ◉ FROM DRAIN HOLE IN MANIFOLD.

2.) PRESS THE (2) DOWEL PINS IN THE SHAFT UNTILL THE PINS PROTRUDE 9.0 FROM END OF SHAFT.

3.) ASSEMBLE THE PISTON RING INTO THE GROOVE OF THE DRIVE ADAPTER AND AND INSTALL THE ADAPTER OVER THE DOWEL PINS IN THE SHAFT. FASTEN THE ADAPTER TO THE SHAFT WITH (2) CAPSCREWS AND TORQUE PER S574 (OR SERVICE MANUAL) VALUES.

4.) ASSEMBLE THE NEW "O"-RING AND THE AUXILIARY PUMP CARRIER ONTO THE MANIFOLD SO THAT THE "SLOT" IN THE CARRIER BORE ALIGNS WITH THE DRAIN HOLE IN THE MANIFOLD ◉. MAKE SURE THAT THE PLUG IS NOT INSTALLED IN DRAIN HOLE (STEP 1). FASTEN WITH (4) CAPSCREWS AND TORQUE PER S574 (OR SERVICE MANUAL) VALUES.

5.) ASSEMBLE THE SNAP RING INTO SPLINED ADAPTER AND INSTALL THE ADAPTER ONTO THE DRIVE ADAPTER.

6.) INSTALL APPROPRIATE GASKET AND PUMP ONTO AUXILIARY PUMP CARRIER AND INTO SPLINED ADAPTER. TORQUE FASTENERS PER S574 (OR SERVICE MANUAL) VALUES.

| | | |
|---|---|---|
| INTERNAL SPLINE DATA SEE S-435 | | A |
| FLAT ROOT, NUMBER OF TEETH 17, PITCH 12/24, PRESSURE ANGLE 30°, PITCH DIA. (REF.) 1.4167, FORM DIA MIN 1.504 | | |
| MAJOR DIAMETER MAX. | | 1.535 |
| CIRCULAR SPACE WIDTH | MIN. EFF. | .1327 |
| | MAX. ACT. | .1345 |
| MEASUREMENT BETWEEN .144 DIA. PINS WITH NONE TO FLAT | MIN.ACT.REF. | 1.2052 |
| | MAX.ACT. | 1.2078 |
| Ⓐ INTERNAL SPLINE DATA SEE S-435 | | B |
| FLAT ROOT, NUMBER OF TEETH 14, PITCH 12/24, PRESSURE ANGLE 30°, PITCH DIA. (REF.) 1.1667, FORM DIA MIN 1.254 | | |
| MAJOR DIAMETER MAX. | | 1.283 |
| CIRCULAR SPACE WIDTH | MIN. EFF. | .1317 |
| | MAX. ACT. | .1334 |
| MEASUREMENT BETWEEN .144 DIA. PINS WITH NONE TO FLAT | MIN.ACT.REF. | .9574 |
| | MAX.ACT. | .9600 |

SPLINE DATA IN INCHES

842.46
DIMENSION TO SAE #0 HOUSING MOUNTING FACE

SAE J744 No. 127-2/127-4 FLANGE AND SAE J744 No. 38-4 PUMP DRIVE ADAPTER SHOWN ABOVE CENTERLINE

78.00

25.00

ADAPTER, 1017834

RING, M1904L

PIN, MA1035B (2)

RING, A2669FV

Ⓐ ADAPTER, 1017836 (SAE J744 No. 38-4)

30°

SPLINE "A" 33.92 ø ±0.06 SAE J744 No. 38-4 PUMP DRIVE ADAPTER

16.00

17.60 Ⓐ

127.06 ø ±0.03

SPLINE "B" 27.55 ø ±0.03 SAE J744 No. 32-4 PUMP DRIVE ADAPTER

Ⓑ CAPSCREW, MA1062S (4)

NOTE:
WHEN MOUNTING A 4 BOLT PUMP, REPLACE THESE SCREWS WITH STUDS OF ADEQUATE LENGTH TO MOUNT BOTH THE PUMP AND CARRIER. SECURE PUMP AND CARRIER WITH NUTS.

▲ PLUG, M1945T Ⓐ

ADAPTER, 1017835 (SAE J744 No. 32-4)

RING, A2669DG

CARRIER, 1015532

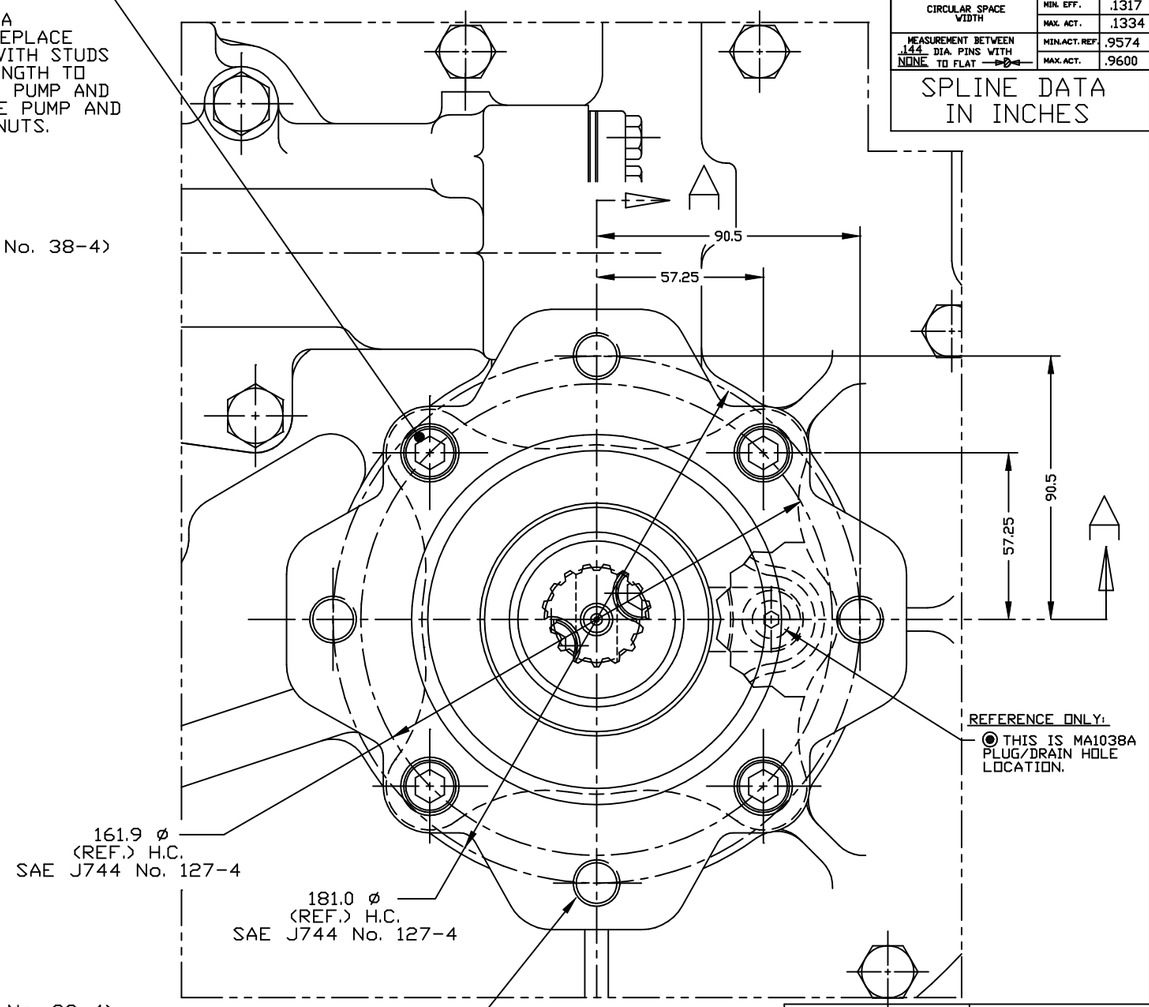
"O"-RING, A2916KD

CAPSCREW, MA1062R (2) Ⓑ

SAE J744 No. 127-2/127-4 FLANGE AND SAE J744 No. 32-4 PUMP DRIVE ADAPTER SHOWN BELOW CENTERLINE

SECTION A—A

742.46
DIMENSION TO SAE #00 HOUSING MOUNTING FACE




REFERENCE ONLY:
◉ THIS IS MA1038A PLUG/DRAIN HOLE LOCATION.

▲ THIS PLUG IS USED ONLY FOR FACTORY INSTALLATIONS OF AN AUXILIARY PUMP DRIVE WITHOUT AUXILIARY PUMP INSTALLED. START M1945T CUP PLUG INTO CARRIER BORE. APPLY A THIN BEAD OF ANAEROBIC SEALANT M2828 TO PLUG O.D. PER S774 AND INSTALL PLUG FLUSH WITH REAR SURFACE OF CARRIER.

MAX. APPROVED INPUT TORQUE TO SAE J744 No. 38-4 SIZE PUMP ADAPTER IS 1,187 N m

MAX. APPROVED INPUT TORQUE TO SAE J744 No. 32-4 SIZE PUMP ADAPTER IS 592 N m

CONSULT SALES DEPT. APPLICATION ENGINEERS FOR OTHER LIMITING CONDITIONS.

METRIC

THIRD ANGLE PROJECTION

SIMILAR TO

| REV | ZONE | CH. NO. | DATE |
|---|---|---|---|
| B | C-3 D-1 | 29757 | 12-1-99 |
| A | A5-6 B6-7 | 28159 | 10-21-97 |

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MATERIAL

HEAT TREAT

SURFACE TREATMENT

WEIGHT kg | WR² N m²

FIRST USE ASSY. 1017020 MODEL TDG-4406

NAME GROUP (AUXILIARY PUMP DRIVE)

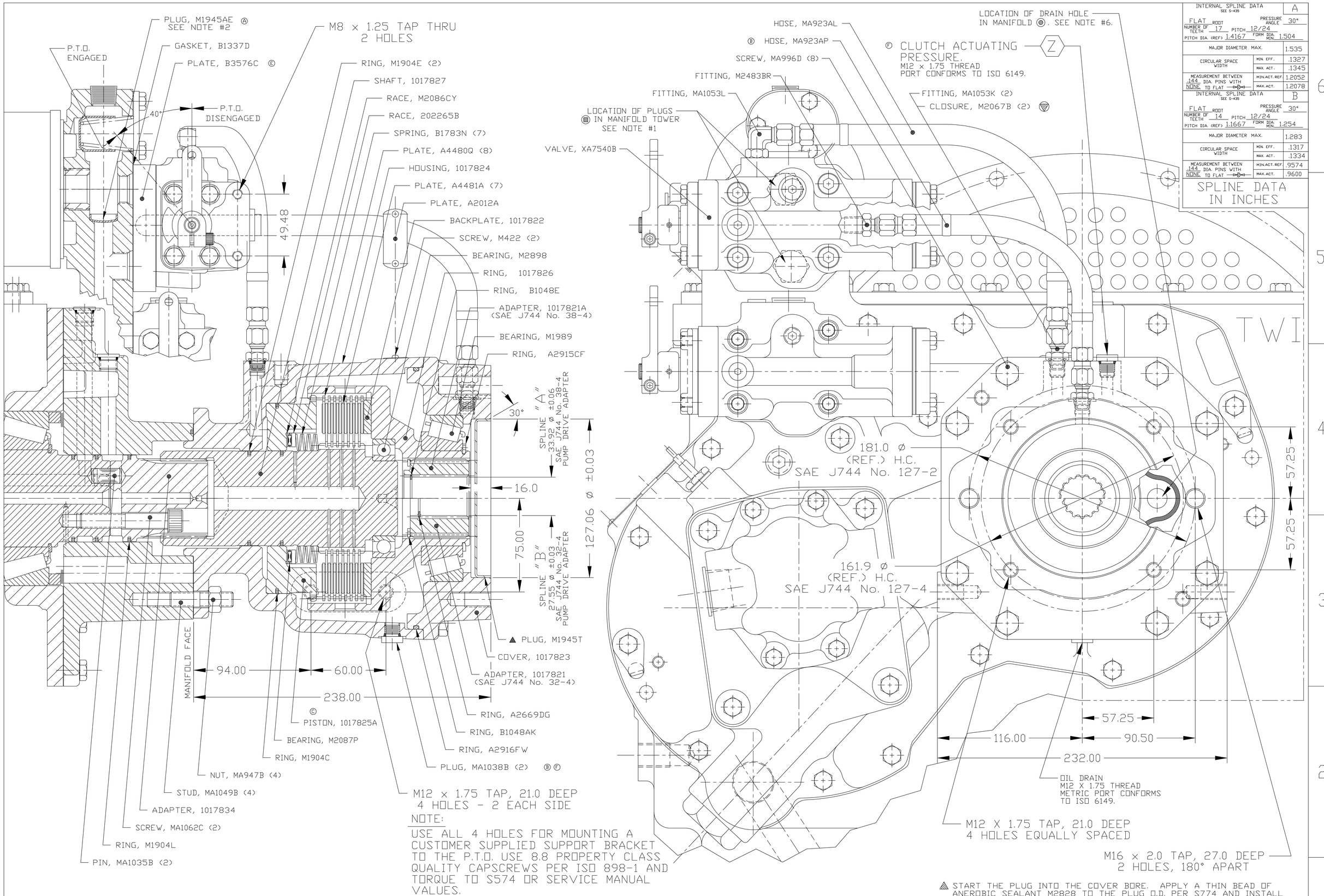
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS X. ±0.75, X.X ±0.25, X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE 11-18-96
SCALE 1.00=1mm
DRN. AZ
CHK. ALC
APPD. DAS

TWIN DISC INCORPORATED RACINE, WI 53403 - USA

1017177

SHEET 1 OF 1 REV B




| INTERNAL SPLINE DATA SEE S-435 | | A |
|---|---|---|
| FLAT ROOT | | PRESSURE ANGLE 30° |
| NUMBER OF TEETH 17 | PITCH 12/24 | |
| PITCH DIA. (REF) 1.4167 | FORM DIA. MIN. 1.504 | |
| MAJOR DIAMETER MAX. | | 1.535 |
| CIRCULAR SPACE WIDTH | MIN. EFF. | .1327 |
| | MAX. ACT. | .1345 |
| MEASUREMENT BETWEEN .144 DIA. PINS WITH NONE TO FLAT | MIN.ACT.REF. | 1.2052 |
| | MAX.ACT. | 1.2078 |

| INTERNAL SPLINE DATA SEE S-435 | | B |
|---|---|---|
| FLAT ROOT | | PRESSURE ANGLE 30° |
| NUMBER OF TEETH 14 | PITCH 12/24 | |
| PITCH DIA. (REF) 1.1667 | FORM DIA. MIN. 1.254 | |
| MAJOR DIAMETER MAX. | | 1.283 |
| CIRCULAR SPACE WIDTH | MIN. EFF. | .1317 |
| | MAX. ACT. | .1334 |
| MEASUREMENT BETWEEN .144 DIA. PINS WITH NONE TO FLAT | MIN.ACT.REF. | .9574 |
| | MAX.ACT. | .9600 |

SPLINE DATA IN INCHES

NOTE:
USE ALL 4 HOLES FOR MOUNTING A CUSTOMER SUPPLIED SUPPORT BRACKET TO THE P.T.O. USE 8.8 PROPERTY CLASS QUALITY CAPSCREWS PER ISO 898-1 AND TORQUE TO S574 OR SERVICE MANUAL VALUES.

▲ START THE PLUG INTO THE COVER BORE. APPLY A THIN BEAD OF ANEROBIC SEALANT M2828 TO THE PLUG O.D. PER S774 AND INSTALL THE PLUG FLUSH WITH THE REAR SURFACE OF THE COVER.

## Ⓐ P.T.O. INSTALLATION INSTRUCTIONS:

1.) REMOVE (2) PLUGS Ⓘ FROM MANIFOLD TOWER.

2.) APPLY M2828 SERIES ANEROBIC SEALANT TO THE O.D. OF PLUG M1945AE AND PRESS INTO MANIFOLD AS SHOWN.

3.) PRESS THE (2) DOWEL PINS IN THE SHAFT UNTIL THE PINS PROTRUDE 9.0 FROM END OF SHAFT.

4.) ASSEMBLE THE PISTON RING INTO THE GROOVE OF THE ADAPTER AND INSTALL THE ADAPTER OVER THE DOWEL PINS IN THE SHAFT. FASTEN THE ADAPTER TO THE SHAFT WITH (2) CAPSCREWS AND TORQUE PER S574 (OR SERVICE MANUAL) VALUES.

5.) INSTALL THE (4) STUDS INTO THE MANIFOLD.

6.) INSTALL THE P.T.O. ASSEMBLY ONTO THE MANIFOLD SO THAT THE SLOT IN THE PTO HOUSING ALIGNS WITH THE DRAIN HOLE Ⓘ IN THE MANIFOLD. FASTEN WITH THE (4) NUTS AND TORQUE PER S574 (OR SERVICE MANUAL) VALUES.

7.) ASSEMBLE THE GASKET, DITCH PLATE, AND VALVE TO THE MANIFOLD TOWER WITH THE (4) SCREWS AND TORQUE PER S574 (OR SERVICE MANUAL) VALUES.

8.) REMOVE (2) CLOSURES, ASSEMBLE THE FITTINGS AND HOSES AS SHOWN.

APPLIES TO MODELS:
MG-5202DC - 1015207A
MG-5170DC - 1017463
MG-516 - XA7470G

MAX. APPROVED INPUT TORQUE TO SAE J744 No. 38-4 SIZE PUMP ADAPTER IS 1186 N-m
MAX. APPROVED INPUT TORQUE TO SAE J744 No. 32-4 SIZE PUMP ADAPTER IS 592 N-m
CONSULT SALES DEPT. APPLICATION ENGINEERS FOR OTHER LIMITING CONDITIONS.

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

| REV | ZONE | CH. NO. | DATE |
|---|---|---|---|
| F | B-5 B-6 | 29590 | 9-17-99 |
| E | E-6 | 29358 | 5-20-99 |
| D | A-1 | 29110 | 2-2-99 |
| C | --- | 29042 | 1-11-99 |
| B | --- | 28863 | 10-20-98 |
| A | E-5 E-6 | 28256 | 12-3-97 |

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MATERIAL Ⓘ | WEIGHT 57 kg | VR* N.A.*
HEAT TREAT | FIRST USE | ASSY. | MODEL
SURFACE TREATMENT | NAME P.T.O. ASSEMBLY

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS X ±0.75, X.X ±0.25, X.XX ±0.13
ALL ANGULAR TOLERANCES ±1° GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

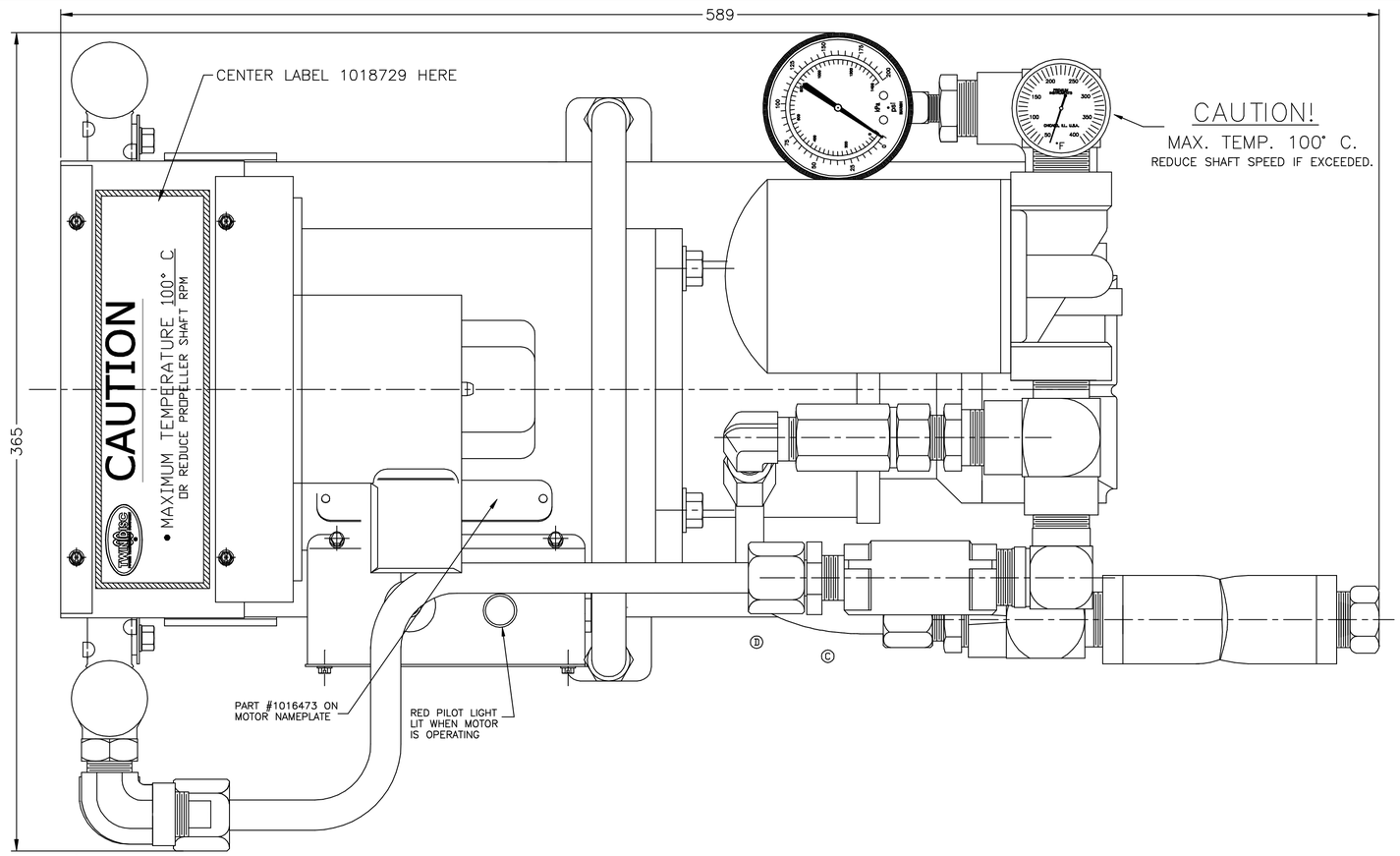
DATE 11-18-97 | SCALE 1.00=1.00 | DRN. AZ | CHK. DAS | APPD. DAS

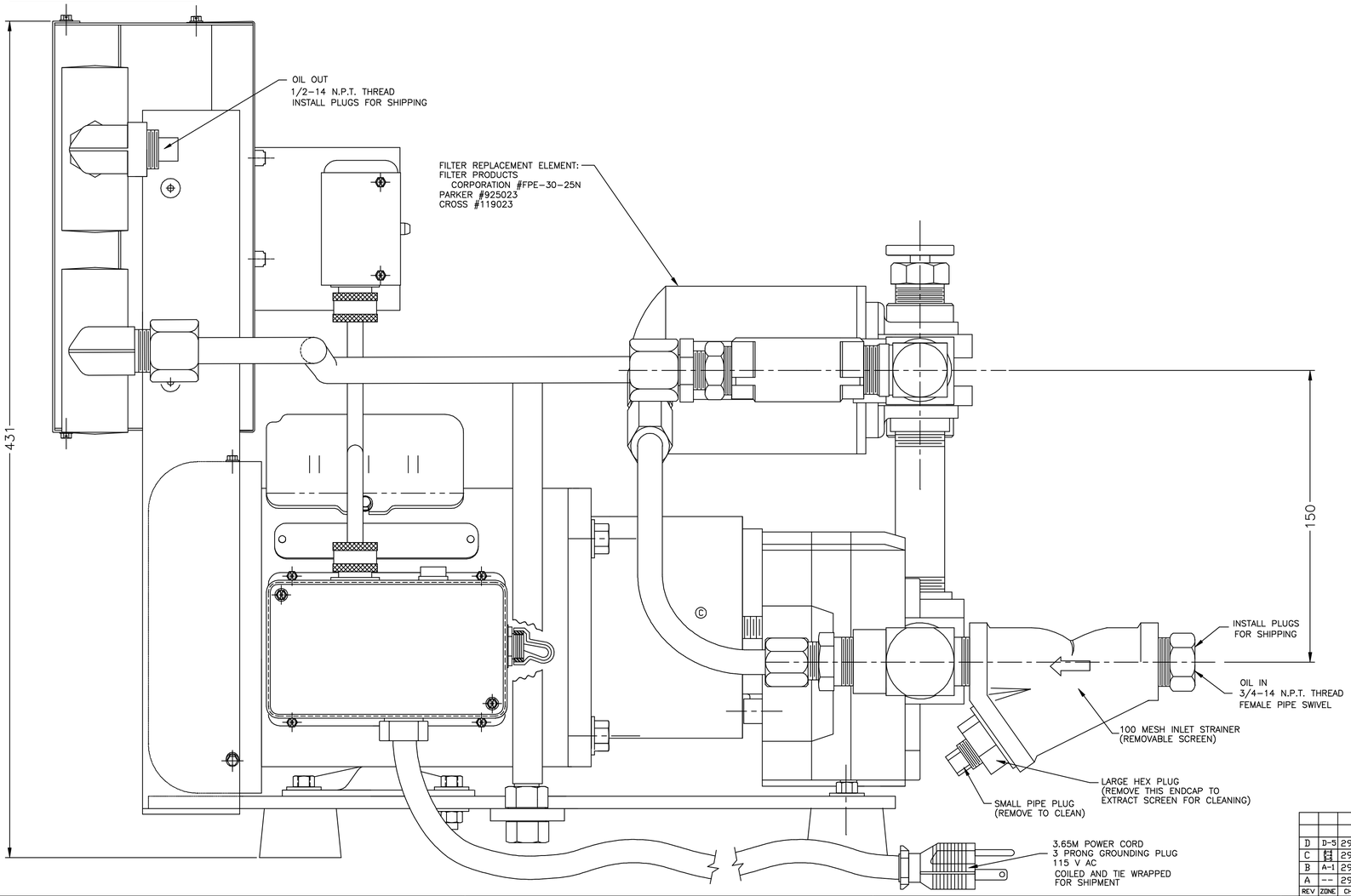
TWIN DISC INCORPORATED RACINE, WI 53403 - USA

1017820

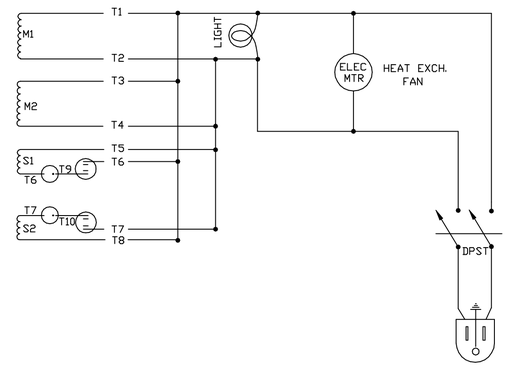
SHEET 1 OF 1 | REV F

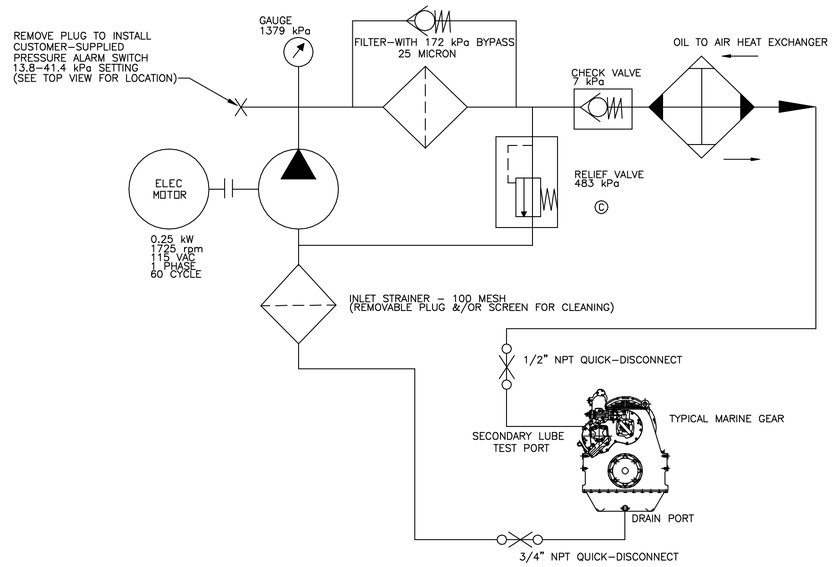
E D C B A
6 5 4 3 2 1




SINGLE PHASE, CAPACITOR, TYPE C, THERMALLY PROTECTED, DUAL VOLTAGE, DUAL ROTATION, 8 LEAD




PUMP FLOW RATE IS 11.0 l/min. AT 102° C.

| REV | ZONE | CH. NO. | DATE |
|---|---|---|---|
| D | D-5 | 29860 | 1-26-00 |
| C | D-5 | 29423 | 7-6-99 |
| B | A-1 | 29078 | 1-19-99 |
| A | -- | 29003 | 12-4-98 |

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METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

| | |
|---|---|
| MATERIAL | |
| HEAT TREAT | |
| SURFACE TREATMENT | |
| WEIGHT | Ⓑ 27.0 kg |
| WR² | N m² |
| FIRST USE | |
| ASSY. | |
| MODEL | |
| NAME | PUMP ASSEMBLY (TRAILING) |

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X. ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

| | |
|---|---|
| DATE | 4-24-98 |
| SCALE | 1:1 |
| DRN. | DMB |
| CHK. | PJL |
| APPD. | DAS |

TWIN DISC INCORPORATED
RACINE, WI 53403 – USA

1016473

SHEET 1 OF 1 REV D

E D C B A
6 5 4 3 2 1

#1017462 03/03

TWIN DISC, INCORPORATED RACINE, WISCONSIN 53403, U.S.A. 262-638-4000/262-638-4482 (FAX) WWW.TWINDISC.COM